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ANNALS

OF

SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE

EDITED BY

LEWIS STEPHEN PILCHER, M.D., LL.D.,

OF NEW YORK,

Surgeon to the Methodist Episcopal Hospital
and to the German Hospital in Brooklyn.

WITH THE COLLABORATION OF

J. WILLIAM WHITE, Ph.D., M.D.,
OF PHILADELPHIA,
Professor of Surgery in the University
of Pennsylvania.

SIR WILLIAM MACEWEN, M.D., L.L.D.
OF GLASGOW,
Professor of Surgery in the University
of Glasgow.

W. WATSON CHEYNE, C.B., F.R.S.,
OF LONDON,
Professor of Surgery in King's College.

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CONTRIBUTORS TO VOLUME XLIII.

ALESSANDRI, ROBERTO, M.D., of Rome, Professor of Surgical Pathology in the University of Rome; Chief-Surgeon in the Policlinic Umberto I.

BARTLETT, WILLARD, M.D., of St. Louis, Missouri.

BARLING, GILBERT, M.B., F.R.C.S., of Birmingham, England, Professor of Surgery in the University of Birmingham; Surgeon to the Birmingham General Hospital.

BERG, ALBERT ASHTON, M.D., of New York, Adjunct Surgeon to the Mount Sinai Hospital.

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CONNELL, F. GREGORY, M.D., of Salida, Colorado, Attending Surgeon to the Denver & Rio Grande Railroad Hospital.

COOPER, CHARLES MINER, M.B., M.R.C.S., of San Francisco, California, Adjunct Visiting Physician to the German Hospital.

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CURL, HOLTON C., M.D., Surgeon United States Navy, Superintendent Colon Hospital, Isthmus of Panama.

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DAVIS, LINCOLN, M.D., of Boston, Massachusetts, Out-Patient Surgeon, Massachusetts General Hospital; Instructor in Anatomy, Harvard Medical School.

DEAVER, JOHN B., M.D., of Philadelphia, Surgeon-in-Chief, German Hospital.

ELIOT, ELLSWORTH, JR., M.D., of New York, Surgeon to the Presbyterian Hospital.

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ELDER, J. M., M.D., of Montreal, Surgeon to the Montreal General Hospital; Assistant Professor of Surgery and Lecturer on Clinical Surgery, McGill University.

FLINT, CARLETON P., M.D., of New York, Attending Surgeon to the Lincoln Hospital; Chief of Surgical Clinic, Roosevelt Hospital, Out-Patient Department; Instructor in Surgery at the College of Physicians and Surgeons of New York City.

FERGUSON, ALEXANDER HUGH, M.D., C.M., of Chicago, Illinois, Professor of Clinical Surgery in the University of Illinois.

FINNEY, JOHN M. T., M.D., of Baltimore, Associate Professor of Surgery in the Johns Hopkins University.

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GIBBON, JOHN H., M.D., of Philadelphia, Associate Professor of Surgery in the Jefferson Medical College; Surgeon to the Pennsylvania Hospital.

HANCOCK, JOHN C., M.D., of Dubuque, Iowa, Surgeon to Finley and St. Joseph's Mercy Hospitals.

HALSTEAD, ALBERT E., M.D., of Chicago, Professor of Surgery in the Post Graduate Medical School; Attending Surgeon to Cook County and St. Luke's Hospitals.

KEILLER, WILLIAM, F.R.C.S. (Ed.), of Galveston, Texas, Professor of Anatomy in the University of Texas.

LILIENTHAL, HOWARD, M.D., of New York, Attending Surgeon to Mount Sinai Hospital.

LE CONTE, ROBERT G., M.D., of Philadelphia.

LYMAN, C. B., M.D., of Denver, Colorado, Professor of Surgery in the Colorado State University.

MACLAREN, ARCHIBALD, M.D., of St. Paul, Minnesota, Professor of Clinical Surgery in the University of Minnesota.

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MUMFORD, JAMES G., M.D., of Boston, Mass., Visiting Surgeon to the Massachusetts General Hospital.

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MARNOCH, JOHN, M.B., C.M., of Aberdeen, Surgeon to and Lecturer on Clinical Surgery at the Royal Infirmary of Aberdeen.

MOSELEY, HENRY PERKINS, M.D., of New York, Assistant Surgeon to the Manhattan Eye, Ear and Throat Hospital (Throat Department).

MAYO, WILLIAM J., M.D., of Rochester, Minnesota, Surgeon to St. Mary's Hospital.

NICOLL, JAMES H., of Glasgow, Professor of Surgery in the Andersonian College.

NOBLE, CHARLES P., M.D., of Philadelphia, Surgeon-in-Chief, Kensington Hospital for Women; Gynecologist to the Stetson Hospital.

NANCRÈDE, CHARLES B. (G. de), M.D., of Ann Arbor, Michigan, Professor of Surgery and of Clinical Surgery, University of Michigan, and in Dartmouth Medical College.

NIETERT, HERMAN L., M.D., Surgeon to the Evangelical Deaconess Lutheran Hospital.

OCHSNER, ALBERT J., M.D., of Chicago, Surgeon-in-Chief of Augustana and St. Mary's Hospitals.

PORTER, MILES F., M.D., of Fort Wayne, Indiana, Professor of Surgery and Clinical Surgery in the Indiana Medical College, Department of Medicine, Purdue University.

PECK, CHARLES H., M.D., of New York, Attending Surgeon to the French Hospital; Assistant Attending Surgeon to Roosevelt Hospital; Instructor in Surgery, Columbia University.

PEDERSEN, VICTOR C., M.D., of New York, Anæsthetist to the Roosevelt Hospital; Anæsthetist and Instructor in Anæsthesia to the New York Polyclinic Medical School and Hospital.

POWERS, CHARLES A., M.D., of Denver, Col., Professor of Surgery in the University of Denver.

RIXFORD, EMMET, M.D., of San Francisco, California, Professor of Surgery in Cooper Medical College.

RUSS, RAYMOND, M.D., of San Francisco, California.

RIGBY, HUGH M., M.S. (Lond.), F.R.C.S. (Eng.), of London, Assistant Surgeon to the London Hospital.

ROSE, LEWIS W., M.D., of Rochester, New York.

RANSOHOFF, JOSEPH, M.D., F.R.C.S. (Eng.), of Cincinnati, Ohio.

RUSSELL, R. HAMILTON, F.R.C.S. (Eng.), of Melbourne, Australia, Surgeon to the Alfred Hospital; Consulting Surgeon to the Melbourne Hospital for Sick Children.

SIPPY, BERTRAM W., M.D., of Chicago, Illinois.

TAIT, DUDLEY, of San Francisco, California.

THIENHAUS, C. O., M.D., of Milwaukee, Wisconsin.

TAYLOR, WILLIAM J., M.D., of Philadelphia, Attending Surgeon to St. Agnes Hospital, and to the Orthopædic Hospital; Consulting Surgeon to the West Philadelphia Hospital for Women.

TOREK, FRANZ, M.D., of New York, Attending Surgeon to the New York Skin and Cancer Hospital; Adjunct Professor of Surgery in the New York Post Graduate Medical School; Assistant Visiting Surgeon to the German Hospital.

VANCE, JAMES, M.D., of El Paso, Texas.

WOOD, ALFRED C., M.D., of Philadelphia, Assistant Professor of Surgery in the University of Pennsylvania; Surgeon to the University, Philadelphia, and St. Timothy's Hospitals.

WATSON, FRANCIS S., M.D., of Boston, Massachusetts, Lecturer on Genito-Urinary Surgery, Harvard Medical School, Junior Visiting Surgeon to Boston City Hospital, etc.

WIENER, JOSEPH, JR., M.D., of New York, Adjunct Attending Surgeon, Mount Sinai Hospital.

WOOLSEY, GEORGE, M.D., of New York, Surgeon to Bellevue Hospital; Associate Visiting Surgeon to the Presbyterian Hospital.

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No. 1

ORIGINAL MEMOIRS.

ON PRESERVATION OF THE NERVE SUPPLY TO THE BROW, IN THE OPERATIVE APPROACH TO THE GASSERIAN GANGLION.

BY HARVEY CUSHING, M.D.,

OF BALTIMORE.

JUDGING from the photographs that have accompanied the reports of cases operated upon by others, as well as from my own experience with the ganglion operation, an almost inevitable effect of the incision, as it is usually made, is a paralysis of the occipitofrontalis muscle (*pars frontalis*) due to the severance of the upper twig of the facial nerve. This highest branch of the "*Pes anserinus*" after crossing the zygoma on its way to the brow takes its course through the subcutaneous tissue overlying the temporal fossa, and thus traverses the direct field of approach to the ganglion. Just below and in front of it lies a separate branch destined to innervate the orbicularis, and some of the proposed methods of approaching the intracranial field of operation must necessarily sacrifice both of these upper twigs of the facial, and so lead not only to the deformity under discussion, but to impairment of the palpebral sphincter as well,—a matter of no small moment. It is

exceptional, however,—though the accident has been known to occur,—for the lower of these nerves to be injured either by the Hartley-Krause procedure or by the modification of their method which I have favored. Section of the upper twig, on the other hand, can hardly be avoided in making the usual horseshoe-shaped incision so commonly employed. Heretofore, so far as I am aware, no effort has been made to preserve this nerve; the operation in itself being considered so serious a one that such a trifling postoperative palsy as results from its division has hardly seemed deserving of attention. The deformity is not an obtrusive one, only showing when there is an effort to raise the eyebrows, or in old people by a planing out of the transverse folds of the brow on the side of the neurectomy (Fig. 1). Nevertheless, as an operation develops, it is well to improve its technique even in the smallest details, and a modification of any operative procedure which can, even in slight degree, improve its cosmetic result, is most desirable, and this is especially so when a palsy of the expressional musculature is concerned.

In a recently printed paper dealing with this operation,* comment was made upon this slight paralysis, and the opinion was expressed that an effort to save this small nerve would so further complicate an already complicated operation that the attempt would be injudicious. It was also noted that in a few of the cases of my series there had been a partial restoration of the power to elevate the brow, due, it was presumed, to the painstakingly exact approximation of all the divided tissues at the time the wound was closed. For, if unnecessary scar formation or the interposition of other tissue does not prevent, there is a natural tendency on the part of severed peripheral nerves to reunite and to re-establish connection with their old terminals. In the case, however, of such a long and delicate nerve as that under discussion, this good fortune can rarely be expected.

* "The Surgical Aspects of Major Neuralgia of the Trigeminal Nerve." *Journal of the American Medical Association*, March-April, 1905.

In my last five operations I have again turned my attention to the question of preserving this nerve, and have found, contrary to my expectations, that the incision and approach to the skull could be so altered as to avoid injuring it without adding particular difficulties to or modifying in any great respect the subsequent steps of the operation. Four of these cases have been total extirpations for major neuralgia; in the fifth I had to be satisfied with simple division of the sensory root of the trigeminus,—a case in which an inoperable sarcoma had grown up through the base of the skull under the ganglion, causing severe trigeminal pain. The malignant nature of the disease from which this patient was suffering rendered the question of cosmetic result far less important than in the neuralgia cases, and consequently the zygomatic arch was not removed, but in other respects the method of approaching the ganglion has been the same in each of the five cases.

The situation of the incision can be seen by consulting the accompanying photographs of one of the patients. It has been made within the hair margin, not for the purpose of concealing the scar, because these cicatrices are almost invisible after the operation, but, as has been stated, in order to avoid division of the nerve. The posterior limb of the incision is carried down the zygoma over the temporal vessels, which usually must be ligated. The skin flap is then reflected downward and forward by blunt dissection, the handle of the scalpel sufficing for this purpose. The temporal fascia, thus exposed, is incised in a line concentric with the skin incision and likewise reflected. The zygoma, which has thus been brought into view at the lower angle of the wound, is then shelled out of its periosteal sheath, not as formerly described by making an incision along its external surface, but by crowding forward its coverings en masse. The exposed fibres of the temporal may then be divided as usual by a horseshoe-shaped incision, and the muscle scraped away with a periosteal elevator as far down as the base of the skull. In order to satisfactorily expose the skull, a little deeper retraction of the flap is necessary than by the older method, the ordinary small appendix retractor

being used for the purpose of holding down the cutaneous and fascial part of the flap as well as the muscle. From this point on the operation is conducted as heretofore described.

In the first of these cases, when the skin flap had been retracted, the nerve to the brow was exposed, and, though efforts were made to preserve it, it doubtless suffered injury through stretching during the downward retraction of the flap in the subsequent stages of the ganglion extirpation. Immediately after the operation it was found that the customary inability to elevate the brow was present; but the paralysis was of short duration, and before the patient was discharged from the hospital two weeks later, it had so far recovered that almost a symmetrical wrinkling of the two sides of the forehead was possible (Fig. 3).

In the other four patients even this temporary palsy of the nerve was avoided, and the cases are so much alike that it is needless to give more than this one series of photographs to show the situation of the incision, which did not interfere with subsequent innervation of the occipitofrontalis, and at the same time allowed sufficient access to the ganglion to insure a total extirpation.



FIG. 1.—Photograph of a patient in whom the highest branch of the facial on the left side has been divided, as in the usual temporal incision; to show the deformity under discussion. Note the sagging of the brow on the left side and absence of frontal wrinkles during the effort to look upward.



FIG. 2.—To show line of incision. Photograph taken on fifth day after operation. All sutures were removed on the second day, except the most anterior one: as scar was almost invisible this one was left to delimit anterior end of incision in photograph. No drainage used.



FIG. 3.—Postoperative areas of anaesthesia; total within inner line. Scars of earlier peripheral operation observable under eye and angle of jaw.



FIG. 4.—Two weeks after operation. Almost total restoration of movement of occipito-frontalis, temporarily paralyzed in this case.

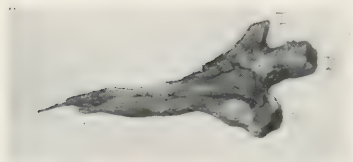


FIG. 5.—Photograph of tissues removed; showing intracranial portion of the fifth nerve intact. Slightly reduced in size. Under surface of ganglion.

THE OPERATIVE TREATMENT OF CLEFT PALATE.¹

WITH A REPORT OF EIGHT CASES.

BY CHARLES H. PECK, M.D.,

OF NEW YORK,

Attending Surgeon to the French Hospital; Assistant Attending Surgeon to Roosevelt Hospital; Instructor in Surgery, Columbia University.

THE relative merit of the operative treatment of cleft palate as compared to the treatment with dental obturators, has long been a matter of dispute. It is not my purpose to enter into a discussion of this aspect of the subject, as my cases are too recent to exhibit final results as to improvement in speech, but rather to call attention to certain points in technique which aid in securing prompt surgical closure of the cleft with a minimum amount of damage to the muscles of the soft palate, so important an element in securing proper enunciation.

The Time to Operate.—Children six or seven years of age are, I believe, the most favorable subjects for operation from the purely surgical standpoint. The mouth is sufficiently large; the loss of blood and shock make little impression on a child of this age; the patients are old enough to give intelligent assistance in the after-treatment and to be taught to wear the protective dental plate to be described later. The very serious disadvantage is that habits of speech are already formed and the defect in pronunciation is undoubtedly more difficult to overcome. Whether we can expect enough gain in this respect, in operations performed at three years of age and under, to counterbalance the increased danger from shock and hemorrhage, the greater difficulty of technique due to the small size of the mouth and the delicacy of the flaps, and the fact that the patient is unable to give any intelligent assistance in the after-treatment, I am as yet unable to determine, as my

¹ Read before the New York Surgical Society, October 25, 1905.

experience in operating at this age is too limited and recent. With the operation in early infancy, ten days to three months of age, I have had no experience. Results in the hands of surgeons other than the originator of the method have certainly not been encouraging and a high rate of mortality is admitted. I have heard of no completely successful case operated upon in this city, and the published reports of the method which I have been able to find have been too vague and void of detail to afford any basis of comparison in regard to actual results.

Anæsthetic, Position and Gag.—I have invariably used the hanging head, Rose position, intermittent ether anæsthesia with an open cone, and the Whitehead gag. I have never resorted to preliminary tracheotomy and do not believe that it should ever be necessary. In adjusting the tongue piece of the gag the tongue should be drawn well forward and to one side with a traction suture passed through its tip (see Fig. 1). If this is not done, as the tongue piece locks the base of the tongue is forced over the entrance to the larynx and breathing is interfered with. After the gag is in place the operator assures himself that breathing is unobstructed and regular before proceeding with the operation; if properly adjusted the gag need not be touched again until the operation is completed. The operator stands at the head of the patient, facing the feet, looking down on the palate from above. Blood and mucus collect in the naso-pharynx, which is easily kept clean by frequent sponging, and little if any blood should get into trachea or œsophagus.

Instruments.—The special instruments used are the Whitehead mouth gag (Fig 1); a very slender knife for transfixing the edge of the flap, paring and splitting the edge of the uvula (see Fig. 2; I have used a cataract knife); a long slender pair of mouse-tooth forceps (Fig. 4); a strong, straight scalpel for making the lateral incisions; a thin, blunt periosteal elevator, slightly curved on the flat; a sharply curved Deschamps's handle needle (Fig. 8, *a*) for passing the heavier sutures; the author's special needle-holder and needles for the



FIG. 1.—Head in Rose position; Whitehead gag in place with tongue drawn well forward and to one side.

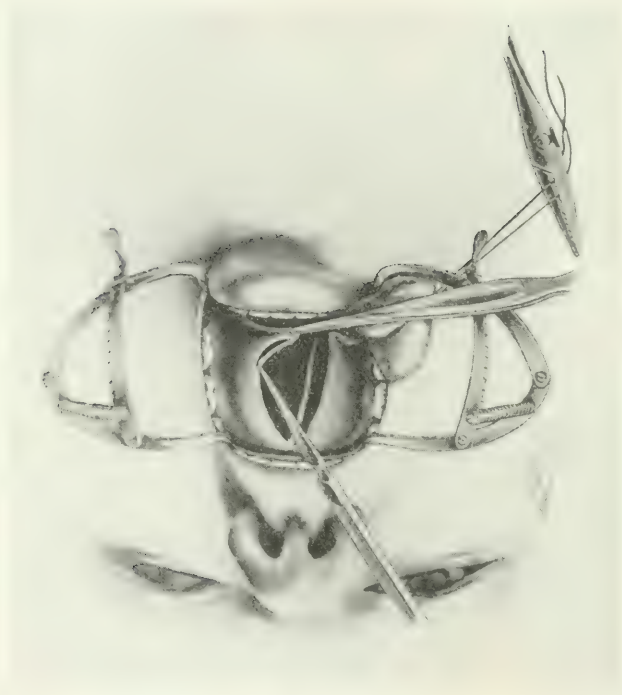


FIG. 2.—Paring the edges of cleft; the strip removed is very narrow and should terminate at base of uvula, the border of which is split; this is not shown in the drawing.

fine sutures (Fig. 8, *b*, *c*, and *d*). This special needle-holder is rather an adjustable handle than a needle-holder proper, and was designed with the assistance of W. F. Ford & Co., to enable the use of the very finest needles, made with an eye in the point, in order to secure accurate apposition without damaging the delicate edges of the flaps. The protective dental plates used in Cases VI and VII, first suggested I believe by Dr. Porter, of Boston, were made from casts of the mouth taken before operation, by Dr. Fiaschi. They keep the tongue off the suture line and are a valuable aid in the after-treatment. Children are easily taught to insert and remove the plate themselves without disturbing the flaps. Fig. 8, *e*, is a drawing of the plate used in Case VI.

The Operation.—The edges are pared by transfixing the edge of the soft palate with a very fine, sharp knife and cutting first forward to the anterior angle of the cleft, then backward, bringing the knife out at the base of the uvula; the strip removed should be as narrow as possible to avoid waste of tissue, but the full thickness of the flap. (Fig. 2.) The mucous membrane of the uvula is then split on its inner border, *i.e.* facing the cleft; it easily separates to give a sufficient raw surface and all of the tissue of the rudimentary half of the uvula is saved. This I believe to be an important modification of the method which I formerly employed, of removing a strip of tissue clear to the tip. The denudation is repeated on the opposite side of the cleft.

The lateral incisions are now made, commencing opposite the last molar tooth close to the border of the gums and carried forward to a point opposite the anterior extremity of the cleft, but taking great care to leave a broad anterior pedicle to the flap, for nutrition. This incision falls external to the posterior palatine foramen and the main trunk of the artery as it runs forward; branches are first divided, the main trunk being usually torn by the periosteal elevator. In clefts running forward through the alveolar process I prefer to leave the extreme anterior end of the cleft for later closure, rather than endanger the nutrition of the flaps by prolongation of the lateral incision

and narrowing of the pedicle. Cases IV and VIII illustrate this condition.

Hemorrhage is free but soon stops spontaneously or with pressure applied with gauze pads on holders while the anæsthetic is resumed.

The curved periosteal elevator is then inserted in the lateral incision, and hugging the bone, is forced carefully through into the cleft; by lateral sweeps the entire flap is quickly separated, including the muco-periosteum at the anterior angle of incomplete clefts. Posteriorly the instrument is strongly carried outward and backward (Fig. 3) along the posterior margin of the hard palate, and to a great extent detaches the palatine aponeurosis and the mucous membrane on the nasal aspect of the velum from the bone. In the majority of cases hemorrhage soon ceases to be troublesome after this blunt separation: posterior branches of the descending palatine artery remain uninjured for nutrition of the posterior portion of the flap, even after very free separation with the raspatory. The inner edge of the flap is then seized with mouse-teeth forceps at the base of the soft palate, *i.e.* where the muscular pull concentrates (Fig. 4; the forceps are shown grasping the flap too far forward); a thin, straight bistoury is inserted through the posterior part of the lateral incision, and cutting outward and backward as traction on the flap is made toward the median line, the detachment of nasal mucous membrane and palatine aponeurosis from the posterior border of the hard palate is completed, and by a careful sawing motion enough of the mucous membrane of the naso-pharynx divided to allow the edges of the flap to fall to the median line without tension. Few if any of the fibres of the bellies of the levator or tensor palati are cut.

The palatine aponeurosis which receives the insertions of the tensor and levator, is completely detached from the posterior border of the hard palate as far outward as the base of the hamular process, together with the mucous membrane on the nasal aspect of the soft palate, allowing the velum to drop downward. This aponeurosis with its muscular insertions



FIG. 3.—Elevating the muco-periosteal flap; the lateral incisions have been made; the elevator is inserted through lateral incision



FIG. 4.—Relieving tension by dividing palatine aponeurosis and mucous membrane on nasal aspect at posterior border of hard palate; bistoury inserted through lateral incision cuts outward and backward; forceps shown grasping flap too far forward.



FIG. 5.—Four of the heavy sutures passed and ends secured; the fifth is being passed with the Deschamp needle, the loop grasped with thumb forceps as the needle is withdrawn.

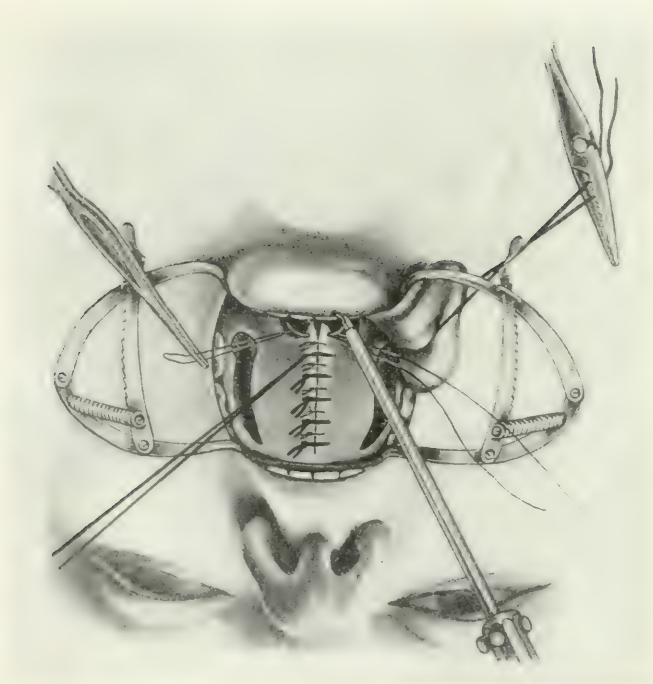


FIG. 6.—The heavy sutures have all been tied; the intermediate stitches have been passed and tied except the last one at tip of uvula, which is being passed with the fine special needle; the end of the last heavy suture is left long for traction during suture of uvula.

remains in the flaps. In cases of wide cleft, tension on the flaps is still caused by the shortened salpingo-palatine fold of mucous membrane running upward and backward on the lateral wall of the pharynx along the belly of the levator palati. Free division of this fold by gently tearing with the finger or snipping with blunt curved scissors as traction is made on the flap downward and inward to make it prominent, is easily accomplished without damaging the muscles, and effectually relieves tension. All this can be done without unduly narrowing the bridge of tissue behind, or endangering the nutrition of the flap.

By this time the hemorrhage has nearly ceased and the flaps are ready for suture. Beginning close to the base of the uvula, sutures of iron-dyed silk No. 6 are passed on the Deschamp's-handle needle through the entire thickness of both flaps at a sufficient distance from the edge to guard against cutting through; these are left untied until the last is passed, four or five being usually sufficient, placed one-fourth to one-third inch apart. They are then tied in order, with a surgeon's knot, usually beginning with the posterior stitch, the ends being left long for the time. Intermediate stitches of iron-dyed silk No. 3 are then placed between each of the heavier stitches, and two or three in the uvula itself, the last at its tip or even on the nasal aspect. They are passed on the very fine special needles with eye in the point, carried on the special needle-holder; they include only part of the thickness of the flap, are closer to the edge, are tied immediately and insure accurate apposition of the edges, such as is aimed at in all fine plastic work. Five to seven of these are used, making in all ten or twelve sutures (Fig. 6). The long ends of the heavier sutures are used for traction and steadying the flaps during the passage of the fine sutures, especially in bringing the uvula forward (Fig. 6). Each, as it has served its purpose, is cut short.

The operation is now completed except for the treatment of the lateral incisions. Formerly I packed these with a strip of sterile gauze, bringing the end out at the angle of the mouth and attaching it to the cheek with adhesive plaster. In my last

two cases I have used a device suggested by C. H. Mayo: a piece of white tape is passed around both flaps through the lateral incisions, drawn just tight enough to approximate the flaps slightly and guard against tension, and secured by a silk ligature. The ends are cut short and slid around to the nasal surface of the flaps (Fig. 7). This is left in place seven days and serves for drainage as well as the relief of tension; I have been much pleased with its effect in the two cases mentioned.

The time required for the entire operation is about one hour, ranging from 55 to 65 minutes in six of my eight cases. One case was completed in 45 minutes and one took two hours. In none of my cases has the hemorrhage been at all alarming, nor has serious shock occurred.

After-Treatment.—I have made this very simple. Sterile water is given by mouth with a spoon after the first twelve hours; feeding with sterilized milk, given in the same way at frequent intervals, is commenced at the end of 24 hours, and the quantity increased rapidly to full milk diet. I have never resorted to rectal feeding and none of my patients has suffered seriously from lack of nutrition. The lips, teeth and tongue are kept clean with boric acid solution, but no attempt is made to cleanse the palate or nasal fossæ. I prefer to trust to the primary adhesion and disturb it as little as possible.

The use of the protective dental plate made by Dr. Fiaschi protects the suture line from the tongue, especially in the act of swallowing, and is of great value when the patient is old enough to allow its use. It should be removed every three or four hours, cleansed in boric acid solution and replaced, preferably by the patient himself. I first saw it used by Dr. J. A. Blake. Both of the cases in which I used it healed by primary union throughout, one of them having been operated upon three weeks before with total failure of union.

When packing is employed in the lateral incisions it is removed on the fifth or sixth day and usually not replaced. In the two cases in which I have employed the tape I have removed it on the seventh day. Stitches are usually removed on the ninth or tenth day. Many of the small defects which



FIG. 7.—The tape has been passed through the lateral incisions around both flaps; the ends, fastened with a silk ligature and cut short, have been slid around to the nasal surface of the flaps.

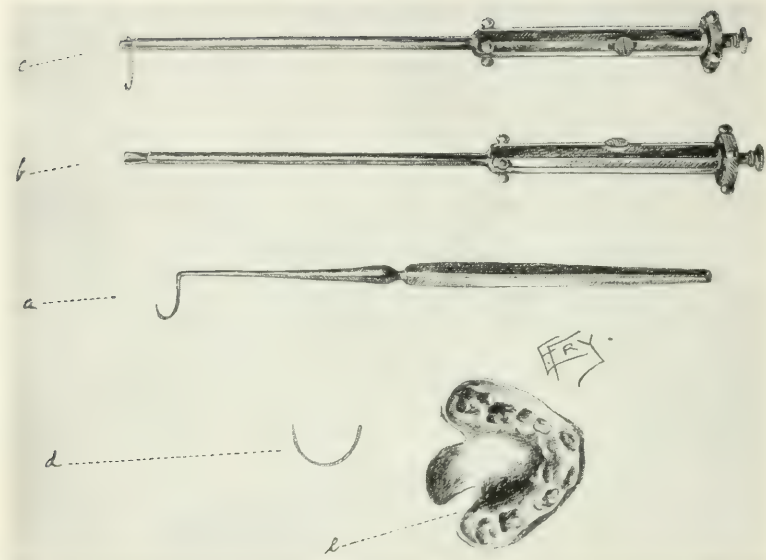


FIG. 8.—*a* right angled, half circle curved, Deschamp's handle needle with Hagedorn point; *b* author's special needle holder, open; *c* Author's special needle holder with needle in place; it is held very firmly; *d* special needle with eye in point; made very fine; half circle curved; surgeon's point; *e* Protective dental plate made by Dr. Fiaschi for Case VI; fits over upper teeth and gums and is held by suction; tail piece to protect soft palate and uvula

so frequently occur at the junction of the hard and soft palate will heal by granulation in two or three weeks; persistent ones or defects in the uvula are closed by secondary suture.

CASE I.—Male, nineteen years of age; lumberman. Operated upon at Roosevelt Hospital, service of Dr. R. F. Weir, February 16, 1904, for complete cleft of soft and hard palate extending forward to incisor teeth. Cleft wide, arch high, no previous operation; right unilateral harelip. Palate operated upon in the usual way; lateral incisions packed with sterile gauze; no protective plate used.

Plastic on harelip performed at same sitting; time of operation two hours; intermittent ether anæsthesia used. Healing complete by primary union except for a small defect at junction of hard and soft palates which closed by granulation in a few weeks. Left hospital on March 1, 1904. Examined May 1, 1904: defect above mentioned entirely closed but another very small opening had appeared at anterior extremity of cleft. Improvement in speech very slight. Case not seen since May 1, 1904.

CASE II.—Male, ten years of age; schoolboy. Operated upon at Roosevelt Hospital, service of Dr. R. F. Weir, April 9, 1904, for complete cleft of soft and about two-thirds of hard palate. Usual operation performed; time of operation sixty-five minutes.

Complete healing by primary union with no defects; stitches removed on ninth day; no protective plate used. Left hospital April 20, 1904.

Examined October 18, 1905; no defects; soft palate moves freely; improvement in speech only fair.

CASE III.—Male, four years of age. Operated upon at Roosevelt Hospital, service of Dr. G. E. Brewer, July 19, 1904, for complete cleft of soft and about two-thirds of hard palate. Usual operation performed; time of operation 60 minutes; no protective plate used. About the third day after operation child put finger in mouth and broke suture line in anterior portion of hard palate. Another small defect occurred at junction of hard and soft palates, the remainder of the suture line healing by first intention.

An attempt was made to close defects by secondary suture on July 31, 1904, with only partial success, but at time of dis-

charge from hospital, August 2, 1904, both defects were very small.

Patient had not begun to talk prior to operation: he was examined October 18, 1905; he is learning to talk and makes himself easily understood, his parents say, and pronounces many words very well indeed.

CASE IV.—Male, twenty-one years of age. Operated upon at Roosevelt Hospital, service of Dr. G. E. Brewer, July 27, 1904, for very wide, complete cleft of hard and soft palates, extending forward through alveolar process. Harelip had been successfully closed in infancy. The usual operation was performed, no attempt being made to close the extreme anterior end of defect on account of danger to nutrition of flaps. Complete healing by primary union except for a small defect at junction of hard and soft palates which closed by granulation in about four weeks. Left hospital on August 2, 1904, but reported at intervals for several weeks; he failed to return for operation to complete closure of anterior portion of cleft. When last seen improvement in speech was not very marked.

CASE V.—Female, six years of age. Operated upon at Roosevelt Hospital, service of Dr. G. E. Brewer, March 29, 1905, for complete cleft of soft palate extending about three-fourths inch into hard palate. A large adenoid was removed from the nasopharynx, and the usual operation for cleft palate performed; total time of operation 45 minutes. Healing complete by primary union except uvula, which separated and was closed by secondary suture May 31, 1905, healing promptly. No protective plate used.

Examined October 18, 1905; palate perfect except that uvula is diminutive; improvement in speech very marked; pronounces many words perfectly, defect in enunciation seeming hardly more than a lisp.

CASE VI.—Male, seven years of age. Operated upon at Roosevelt Hospital, service of Dr. G. E. Brewer, May 13, 1905, for complete cleft of soft palate extending forward into hard palate about three-fourths inch. Operation performed three weeks ago by another surgeon resulted in complete failure of union. The usual operation performed; time of operation sixty-five minutes. Protective plate made by Dr. Fiaschi used in after-treatment; complete healing by primary union with no defects; stitches removed on the ninth day. Left hospital able

to insert and remove plate himself for cleansing, without touching suture line. Examined October 18, 1905; palate perfect except that uvula, as in Case V, was small, owing partly to the fact that in each the uvula was operated upon a second time. Improvement in speech only fair.

CASE VII.—Male, seven years of age. Operated upon at Roosevelt Hospital, service of Dr. G. E. Brewer, September 22, 1905, for wide cleft of soft palate extending forward to middle of hard palate. Adenoids were operated upon nine days before. The usual operation performed; time of operation fifty-eight minutes. The tape around the flaps was used instead of packing in the lateral incisions; the Fiaschi protective plate was used in the after-treatment. Complete healing by primary union with no defects; stitches removed on the ninth day. Left hospital seven days after operation because he developed chicken-pox.

Improvement in speech is slight as yet.

CASE VIII.—Female, two years five months of age. Operated upon at Roosevelt Hospital, service of Dr. G. E. Brewer, October 12, 1905, for complete cleft of soft and hard palate, extending forward through the alveolar process. Harelip had been closed in early infancy. The usual operation performed, no attempt being made to close the extreme anterior end of the cleft on account of danger to the nutrition of the flaps. Time of operation fifty-five minutes. Tape around flaps instead of packing; no protective plate used as child was too young. Healing of the greater portion of the suture line, the uvula and one stitch in front giving way. Secondary operation will be performed in a few weeks.

The child has not learned to talk as yet, and should prove a good subject in which to study the effect of the operation performed at this early age. A sharp bronchitis complicated the first few days of convalescence.

Summary.—Of the eight cases, three healed primarily with no defects (Cases II, VI, and VII); one after a secondary suture of the uvula (Case V); one is completely healed except for a small anterior defect purposely left to preserve nutrition of flaps (Case IV); two have very slight defects barely admitting a probe (Cases I and III); and one, the most recent, has a defect of the uvula and also an anterior defect purposely left, both of which I hope to close by secondary operation within a few weeks (Case VIII). All of the defects mentioned in Cases I, III, IV and VIII could be easily

closed by secondary operation if it were possible to follow the cases and get them to consent to such procedure, as I hope to do in Cases IV and VIII.

The time spent in the hospital after operation in Cases I to VIII respectively, was 19, 11, 14, 6, 30, 7, 13, and 13 days. None of the cases suffered to any extent from shock or hemorrhage; two had rather sharp bronchitis following the operation, which soon subsided; all were fed by mouth after the first 24 hours. Intermittent ether anæsthesia, with an open, sterile cone was used in all the cases; the time of operation varied from forty-five minutes to two hours, usually fifty-five to sixty-five minutes, a considerable portion of this time being consumed in arresting hemorrhage and renewing anæsthesia. The only suture material employed has been fine iron-dyed silk, No. 6 and No. 3.

Conclusions.—The operation as described is essentially the operation of Langenbeck, and is capable of closing the cleft, if properly carried out, in nearly if not quite all cases of cleft palate, either in children or adults.

The easiest age to operate is from six to ten years, the best age probably from two to three years if it can be demonstrated that the danger is not too great.

The Rose position and the use of the Whitehead gag add greatly to the ease of exposure and control of hemorrhage.

The bellies of levator and tensor palati with their insertions into the palatine aponeurosis, should be preserved, but the attachment of the aponeurosis to the posterior margin of hard palate must be divided, together with the mucous membrane on the nasal aspect of the velum.

Complete relief of tension is essential, and division of the salpingo-palatine fold of mucous membrane is important to secure this.

Suturing should be as carefully done as in any fine plastic operation, and with needles that are sufficiently delicate to avoid injury to the edges of the flaps.

The after-treatment should be simple; no cleansing should be attempted on the palate or in the nasal fossæ; feeding by mouth should be commenced at the end of twenty-four hours. The use of the protective plate is of great value in older children and adults.

ACUTE ŒDEMA OF THE LUNGS SECONDARY TO ETHER NARCOSIS.

BY VICTOR C. PEDERSEN, M.D.,

OF NEW YORK,

Anæsthetist to the Roosevelt Hospital ; Anæsthetist and Instructor in Anæsthesia to the
New York Polyclinic Medical School and Hospital.

THE subject of acute conditions of the respiratory and of the circulatory system during and after anæsthesia of any form is of great importance. The possibility of primary cardiac failure under chloroform is well established as one immediate danger of this anæsthetic. The sequelæ of ether are more likely to be of the secondary type, and to localize in the lungs, usually as lobular pneumonia and infrequently as lobar pneumonia, or in the kidneys, as the various forms of congestion and inflammation. Acute œdema of the lungs is one of the immediate sequelæ of ether narcosis, which, while undoubtedly comparatively rare, must fully be reckoned with.

The following case of it will be of considerable interest on account of the rapidity of its onset, of its long continuation, and of the total recovery of the patient without any after-effects whatever. The case likewise illustrates the extreme importance of examination of the chest in any case of cyanosis, which does not improve when the ordinary precautions and means of restoration of freedom of the upper air-passages have been taken, such as pushing the jaw and pulling the tongue forward and exploring the upper air-passages with the finger. It is in every probability certain that, if the chest of this patient had not been examined instantly with the ear, the œdema would not have been discovered sufficiently early to have rendered medical aid of service.

The incident occurred in the practice of Dr. Charles H. Chetwood, with whose permission and knowledge these notes are published, and whose favor and courtesy therein are hereby acknowledged.

Very full details of the case are given, because absence

of many factors in the cases reported in literature makes some of their notices rather unsatisfactory, as the second part of this paper will indicate.

For convenience of reference in the summary with which this paper closes, this case is called Case XV.

History and Examination previous to inducing Anæsthesia.—May 24, 1903; M. H., male; white; about thirty years old; American Jew; merchant; no previous operation under general anæsthetics; addicted to the moderate use of alcohol, such as the member of a wealthy family would employ socially; about five feet seven inches tall; weighs 120 pounds; of reasonable muscular development; of fair nutrition, although somewhat anæmic; of pale to sallow complexion; hair very dark, and general health good; of rather neurotic temperament; showed considerable fear prior to the operation, although able to enter the operating-room, and, unaided, to get upon the operating table. Examination of his heart and lungs by *cursor*y auscultation over the front and sides of the chest revealed nothing abnormal. The back of the chest was not examined. The heart-beat was about 100 and quite normal in character. The arteries and veins were without feature, and the nose and throat had not been giving symptoms. No cough was present. Both stomach and rectum were empty. The ante-operative urine was normal. No visceral lesions were known to the operator. The pathologic condition was internal and external piles. The patient received no drugs prior to administration of the anæsthetic, which was the nitrous oxide gas and ether sequence with the Bennett inhaler. The posture was dorsal until the anæsthesia was complete, when the lithotomy position was used.

Induction of Anæsthesia.—About one gallon of gas was employed, that is, the ordinary gas-bag of the Bennett inhaler was filled to distention. Under this anæsthetic the patient became somewhat blue and did not show a full degree of its effect, as was proved by the fact that he underwent considerable ether excitement prior to finally getting under. This excitement was so great that restraint was necessary to prevent the patient from writhing off the table. The writer rarely has seen, except in hospital practice among alcoholics, an individual show as much

ether excitement as this man did. After the conjunctival reflex had been abolished, and after the pupils had dilated somewhat, although still reacting to light, the man showed great rigidity of the extensors of the extremities, especially at the knees and elbows. In the effort to overcome this rather obstinate muscular reaction, the anæsthetic was pushed rather hard and fast, and succeeded finally in eliminating the trouble after probably ten minutes' delay, which shows that no undue haste was present. The operation was begun at this stage.

Maintenance of and Condition during Anæsthesia.—The patient, however, did not stay thoroughly under the anæsthetic, in that he showed muscular movements during the operation, insufficiently, however, to interfere with the operator. His color throughout the operation was satisfactory; the pupils were moderately dilated but reacted to light; his pulse was steady at about 90 and his respiration showed the usual ether acceleration. There was throughout the anæsthetization hardly any mucus in the mouth or throat and no audible bronchorrhœa. The operation itself lasted about twenty minutes, and the man was inhaling the anæsthetics about thirty minutes.

The total amount of ether used in the cone was probably four ounces. Unfortunately, the upsetting of the ether-bottle during the stage of excitement made it impossible to measure accurately the amount, but four ounces would be a maximum and three and one-half ounces a minimum estimate. The anæsthetic was withdrawn during the dressing of the patient, and when the dorsal position was resumed, the writer noticed that the man began to get cyanotic, and that his respiration seemed to hesitate, as though he were about to vomit. He was then moved to bed and carefully protected against exposure by being covered, although the day was a rather balmy day (May 24, 1903). The writer stayed with him, noting that he did not vomit and that the cyanosis increased. It was evident that something vital was wrong, and the operator was immediately summoned. By this time (about ten minutes after his return to bed) the man's color was a livid blue and his respirations were beginning to lose their force, although the rate had not materially changed. The writer pushed his finger gently down the patient's throat in order to ascertain whether by some inadvertency he had regurgitated and

then inspired a bolus of food, though this seemed highly improbable, because it had been noticed that he had made no œsophageal movements. The writer passed his finger over the epiglottis and into the cavity of the larynx, and as far as he could reach nothing foreign was encountered. He then put his ear to the patient's chest and to his amazement found a very active universal acute œdema of the lungs in progress. The pulse at this moment was of good quality, about 120 beats to the minute, and the pupils were small and slightly active to light. The patient was given a hypodermatic injection of atropine sulphate, a twenty-fifth grain, and the foot of the bed was slightly elevated to an angle of perhaps fifteen degrees with the floor. Dr. Chetwood then instituted very active dry-cupping with wine-glasses over every part of the chest without turning the patient over. At this moment the patient's heart began to fail, and he was given strychnine sulphate, a twentieth grain, through the needle. With great caution the patient was now rolled upon his right side, and while the writer continued on duty at the head holding the tongue and jaw well forward and, while Dr. E. L. Keyes, Jr., kept the bedclothes from pressing on his abdomen, which up to this moment almost alone had been carrying on the respiratory function, Dr. Chetwood continued the cupping all over the back of the chest. Artificial respiration was not employed at this or any other period of the resuscitation. For the next few minutes, while the cupping was continued, the patient's condition remained unaltered, and then the heart began to show signs of weakness again; he was given two syringefuls of whiskey and another injection of strychnine, bringing its total up to a tenth grain. Auscultation of the chest at this moment showed that the râles were beginning to disappear, although the color was still anything but satisfactory and the pulse was still weak. Auscultation of the heart showed pure muscular tones, so that Dr. Chetwood and the writer remarked that hope of his recovery was appearing. Oxygen arrived about this time, and was administered in the usual manner as rapidly as the patient could possibly use it. His color now began to improve slowly, but his pulse was still unsatisfactory. He accordingly received nitroglycerin, a twenty-fifth grain, hypodermatically, from Dr. Keyes. This was at the end of about forty minutes of work upon the patient. In a few

moments the great value of this injection appeared and the pulse became much stronger and bounding. When this condition was apparent, the foot of the bed was raised to an angle of forty degrees with the floor. These two details of treatment, the large dose of nitroglycerin and the increase in the inversion of the body, appeared to have accomplished, next after the cupping, more than any other one element of treatment. From that moment on the patient's condition became promising, but the responsibilities of the issue were great enough to warrant a consultation, and accordingly Dr. Walter B. James was called. His physical examination confirmed our findings, viz., that the râles had disappeared from the entire chest with the exception here and there of an occasional "click." He also agreed that the heart, all things considered, had returned to practically its normal condition, but recommended, as a general cardiac support and as a final precaution, that five minims of the tincture of digitalis be administered. This medication was the last the man received. Dr. James also concurred in our prognosis that the patient would recover, and believed that no late lung complications would appear. A few moments after Dr. James's withdrawal the case was left in the writer's hands, and he used the following course of treatment during the next hour and a half: The respiration steadily gained in force and decreased in frequency, until after about one hour the cyanosis of the face, mucous membranes, and finger-nails, which were carefully compared with those of bystanders as standards, had disappeared. Every ten minutes the front and sides of the chest were auscultated, and every twenty minutes the patient was rolled upon his side and the back of the chest was auscultated. At none of these examinations were there râles, but a click (without dulness) was present at inspiration only in the left infraclavicular region, which had totally disappeared by the time Dr. E. L. Keyes, Jr., assumed charge of the case early in the evening. The pulse was at this time steady and regular at about 80 to 90 beats to the minute, of good force and quality, and the heart sounds were firm and muscular. The capillary circulation was efficient wherever and whenever tested by pressure over a bony prominence, to squeeze out the blood and observe its return, for instance, at the finger-nails. The pupils at this stage were moderately dilated and very reactive to light.

The action of the pupil was throughout the case very interesting. At no time was reaction to light totally abolished, and only for brief intervals was the pupil widely dilated, notwithstanding the fact that the patient had received rather a large dose of atropine. The effect of this drug on his respiration and circulation was admitted, but for some unknown reason the pupil showed scarcely any effect whatever. All the drugs administered were from the author's hypodermatic set, always carried for emergencies in solution. It is possible that the atropine had lost its activity on the pupil. This is not likely, because the chemist of the New York Hospital states that solutions of atropine there have not been known to deteriorate, although kept in stock indefinitely in the same kind of rubber-capped half-ounce bottles as the writer always carries. No morphine was at any time administered. Oxygen was inspired by the patient constantly from the time of its delivery at the house up to about one hour after the writer was left alone with him. It was suspended when no further improvement of the color continued, and when his parents admitted that his visage was, as far as they could see, perfectly normal.

Conjunctival reflex was present in a moderate and sluggish degree just before Dr. Chetwood and Dr. Keyes, Jr., left, and in an active degree about a half hour later. No vomiting whatever occurred until some time after the cyanosis was absent, when, without warning, the patient, with a loud, shouting phonation, vomited up a few drachms of mucus, and then answered slowly when called by his mother, and looked in a dazed fashion at the writer when he likewise addressed him. About a half hour after this the patient repeated the vomiting and was able to ask why he had a sore chest.

One extremely interesting feature throughout the convalescence, which was noticed by all present, was that there was at no time any perceptible mucus in the trachea, larynx, or mouth. This was true during the initiation and maintenance of the anæsthesia and the convalescence. Although the patient vomited a little mucus, he coughed up absolutely none. The whole disease process appeared to have found its origin in the air-vesicles, to have reached its acme there, to have run its course there, and to have ended there.

The behavior of the heart was most instructive, because, while the œdema was developing, its action was, broadly speaking, normal, although accelerated, and only after the œdema was so fully established, that the respiratory function had begun to fail, were unfavorable signs from the heart noticed. It seemed probable, therefore, that the œdema was primary in the lungs and not in the right heart.

It matters not which of these two conflicting views be correct—whether the œdema had been primary in the lungs, and only when of sufficient degree to interfere with the circulation had caused cardiac obstruction, and then incipient cardiac failure, or whether the ether had had, as it occasionally does, a selectively depressing action upon the right heart, and after having excited this phenomenon primarily, had set up œdema in the lungs secondarily.

The case is positively the most interesting in the writer's experience in anæsthesia work, and he believes it to be one that is not without clinical importance. There are very few cases of acute œdema of the lungs secondary to ether narcosis reported in literature. F. W. Hewitt (called Case XVI in the closing table of this paper), in his admirable work on "Anæsthetics and their Administration," alludes to a fatal pulmonary œdema in a patient who was the victim of paralysis of the diaphragm, which no doubt in itself was an important causative factor. In the patient under discussion, however, the diaphragmatic respiration was practically the only one at work during the acme of the trouble, so that a parallel between these two subjects cannot be appropriately drawn.

The only other case of œdema of the lungs under anæsthesia, which the author has himself seen, was at the Sloane Maternity Hospital. The subject was a negress, about thirty years old, suffering from eclampsia. *Chloroform* was being administered by him drop by drop with the utmost precision and caution, when prior to circulatory difficulty the œdema began. This patient was saved in exactly the same manner as the writer's male subject, namely, by active dry cupping over the whole chest, first on the front and sides and then, after

these had improved, on the back. *Veratrum viride* was employed to dilate the arteries and quiet the circulatory excitement, which was very marked. No parallel may be drawn between this case and that which has been described, because the eclampsia itself may have been partially or totally the cause of the trouble, and the anæsthesia a mere incident: moreover, ether was not employed at all.

DEDUCTIONS.

The lesson which is to be drawn from this case, which might quite well have been a fatality, is that ether even when given carefully may occasionally cause pronounced and dangerous irritation of the air-vesicles. The man probably received somewhat less than four ounces in from thirty to thirty-five minutes of administration, but the operation was rectal, and resistance to ether was present in his nervous system throughout that time. Consequently, the writer is of the opinion that the œdema was not due to an excessive amount of ether. The œdema may, however, have been induced by the circumstance that when rigidity appeared in the extensor muscles traditions of training and observation were followed in pushing the ether rather rapidly to overcome this complication. It is conceivable that the irritation of the lungs began with this *concentrated* dose of the anæsthetic, although in actual amount it should not be considered proportionately excessive; and although at the moment no unfavorable reaction on the part of the patient was observed, and ten minutes (a proper delay) elapsed before the operation began.

Since this case occurred, the writer has followed the practice in his own work and in the teaching of those he has had the pleasure to meet as instructor, that when any such resistance to the anæsthetic occurs, it is best to wait patiently for it to disappear under a steady and gradually increasing exhibition of the anæsthetic. In this way he does not like to have an operation begin on such a subject much short of ten minutes after the beginning of the inhalation of the drug, whereas under

the former procedure the work usually began in less than half this time. He has been rewarded by finding that cases which promised to be troublesome by some such incident at the beginning have followed an anæsthesia with much less difficulty, or none throughout. The principle at stake is that of teaching a boy to swim. If we throw him off the dock into deep water his danger of drowning is extreme, whereas, if we lead him gradually, he may by instinct take care of himself by swimming in water sufficient for that purpose and yet not really beyond his depth.

Another lesson which the writer draws from this case is that of listening to chests after ether narcosis, whether the patient does well or not under it. He has been astonished to find the great number of subjects who show râles in the chest here and there, even when the bronchorrhœa has been immaterial or absent. When the bronchorrhœa is extreme, the noise transmitted down the bronchi is so great that the distinction between the transferred sounds and sounds within the air-vesicles may scarcely be made.

The cases to which attention is drawn, however, are just the opposite of these, namely, where, with a clear throat and free trachea, bubbling sounds are present here and there over the thorax. Putting these two facts together, as the basis of present practice, the writer now takes time, and if necessary plenty of it, to get the patient thoroughly under the ether slowly before he is transferred to the operating table. In the case reported, ten minutes' delay in this process was made; doubtless much longer time would have been better.

In connection with the subject of râles after ether narcosis, the writer has been informed that at the Royal Victoria Hospital in Montreal all subjects of etherization are during convalescence from narcosis protected with a pneumonia jacket: a most wise precaution, simply taken.

A third lesson indicated by the case is that elevation of the foot of the bed has a very great beneficial influence on these patients. Many hold that more harm than good is done to a failing heart by this procedure. With this view the writer dis-

agrees, and believes that the procedure of first elevating the bed slightly and then fully, contributed very materially to the recovery of this patient. In fact, when the second elevation was done, Dr. E. L. Keyes, Jr., remarked that it appeared to have benefited the clinical conditions better than anything else tried. The writer thinks that when difficulties after operations arise, one should consider what the condition of the blood within the patient is, namely, that the great veins of the abdomen, which are capable of holding all the blood of the body, are at the moment, in fact, thus distended, either through the failing heart or the shock of the patient. Against this inert accumulation the heart must work while the arteries themselves contain too little blood to constitute the normal bulk of fluid for propulsion. It is therefore rational to believe and to practise that an elevation of the foot of the bed just sufficient to make the blood flow out of the veins into the heart slowly, to be sure, and under low pressure, so that the intermittent heart action may accommodate it, is exactly the kind of aid which the heart needs to supply it with the blood required to combat this disadvantage of failure, whether from shock or from paresis of its own muscle.

The writer believes, therefore, that this middle view between extreme elevation, which might engorge and stop the heart, and no elevation, which might embarrass it through lack of blood to pump through the arteries, is the correct and rational procedure. He considers the other dictum wrong in refusing to elevate the bed at all, but right in stating that it should not be elevated to the extreme.

Hewitt says in his book: "It is a popular fallacy to imagine that because heart sounds are normal and no visceral disease can be detected, the anæsthesia will run a perfectly normal and straightforward course." This statement agrees perfectly with the writer's experience, which is now considerable, and only reinforces the statement with which he would close this section of the paper, namely, that it is proper to allow the anæsthetist plenty of time to find the pace of his subject in order to run the race of the operation evenly with him. For the

purposes of comparison and for the sake of completeness, it has seemed well to include in this discussion similar cases reported in literature. For the following list of cases the writer is indebted in large part to Dr. Edward W. Preble of this city, who very kindly and faithfully looked up the matter.

CASE I.—MORTON (*American Journal of the Medical Sciences*, vol. lxxii, New Series, 1876, page 411). Patient aged nineteen years; male; no history of winter cough or previous chest trouble; general health not vigorous, but not markedly impaired by spinal (probably spondylitis) and knee lesions; no evidence of hereditary disease; operation for ankylosis of the knee, June 3, 1876; narcosis lasted twenty minutes; $2\frac{1}{2}$ to 3 ounces of ether used poured upon a towel, no inhaler as such employed. At the close of the operation, pallor and depression, with the usual postoperative degree of comfort, present; fifteen minutes after operation, and during consciousness, asphyxia developed, most marked in the face and finger-tips; pulse moderately full, about 160; respiration nearly ceased; tongue depressed, and cold water dashed upon the chest; only violent respiratory movements followed; a half-hour later the heart still acting, though labored, and throat filled with bloody mucus; evidences of pulmonary engorgement present; radial artery opened, 8 ounces of blood withdrawn and dry cups applied to the chest; for a time respiration improved, and volume of pulse increased somewhat and fell from 160 to 152; hypodermatic injections of whiskey and carbonate of ammonium failed to revive him from a sinking spell, during which he died after about another hour, that is, about two hours after the operation. The autopsy showed pleuritic effusion, old "infiltrating" pleuritic adhesions scattered everywhere, most marked at right base; œdema of the lungs; deformity of chest; lumbar kyphosis; displacement of abdominal viscera, and fluid in the pericardium. (No note as to renal or encephalic conditions.)

CASE II.—SAUNDBY (*British Medical Journal*, October 13, 1877). Patient aged thirty-five years; female; October 4, 1877, operation for ankylosis of the knee; "about an ounce" of ether; Ormsby inhaler; narcosis normal throughout; recovery from the anæsthesia; one and a half hours later developed cyanosis; failure of the pulse; râles over both lungs. The patient was well wrapped up and carried directly from the operating theatre across an open court to a detached building of the hospital, fifty yards away. Was conscious upon reaching the ward, and spoke to the nurse, who noted nothing unusual in the patient's condition. This procedure of carrying the patient across the court-yard was contrary to the rules of the hospital, and happened in the absence of the house-surgeon. Saundby adds that he cannot state whether or not this exposure had anything to do with the œdema. The autopsy showed effusion into the arachnoid; œdema of the lungs; but otherwise negative.

In the opinion of the author, exposure during the operation at any time, excepting as absolutely necessary and during convalescence from the anæsthetic, in any way, is extremely hazardous. His practice is to direct that the patient be kept covered most carefully and completely, excepting the face for breathing, until complete consciousness is restored, so that the patient may direct the attendants himself as to his feelings of chilliness or warmth. Protection against draughts and changes in temperature is also of extreme importance. All patients perspire slightly, and most patients very freely during the later stages of narcosis and during recovery. Any exposure which tends to check this activity of the skin must be very dangerous to both the lungs and the kidneys. It is probably proper to observe that the exposure noted by Saundby was undoubtedly a very important feature in the case. This opinion is borne out by one experience which the writer has had in the only fatal pneumonia he has had among his anæsthesia patients, which occurred as follows: A perfectly healthy, middle-aged man was under ether fifty minutes for a difficult herniotomy, and consumed two and three-fourths ounces of ether (measured) through the Bennett inhaler, with the upper air-valve open, without any unfavorable symptoms whatever, excepting very free perspiration. The writer was excused by the surgeon to go to another case, and therefore did not see the patient put to bed and could not carry out his usual precautions of protection, as just stated. The surgeon later admitted not only that they were not carried out, but also that a window at the head of the bed and a door at the foot of the bed were left open by the nurse, apparently on the supposition that the hot air of August would do no harm. Congestion of the lungs at once developed, and after three or four days double pneumonia appeared, lobar in type, most severe on the right side, which was the nearer to the open window. The opinion of the medical consultant is quoted in saying that the ether itself had nothing to do with the case, because the pneumonia was lobar in type, and developed so long after the narcosis.

The exposure, in his opinion, on top of the perspiration spoken of, probably was the exciting factor.

It is well to call attention again to the pneumonia jacket used in some hospitals during recovery from ether narcosis.

CASE III.—PARSONS (*Medical News*, March 18, 1882, page 295). Female; aged fifty-four years; normal heart and lungs; reduction of old dislocation of the shoulder, February 16, 1882; narcosis lasted twenty-five minutes; 6 ounces of ether inhaled (method of administration not stated). Recovered from the anæsthesia within five minutes; in one and one-quarter hours cyanosis developed, with death following upon a high degree of pulmonary congestion. Five minutes after the reduction the patient asked for a drink of water, and a little later wished to go home. After attending to a few remaining patients, the doctor left her in charge of a friend and the janitor; after about a half hour she was again seen by the anæsthetist, and an hour later the house-physician was notified that she was dying; he then found her in a cyanosed condition. Two hypodermatic injections of ether were given, 20 minims each, and three or four injections of brandy. Twelve or fifteen dry cups were applied over the chest and other stimulating remedies resorted to; death occurred about one hour after. The autopsy showed heart, liver, and one kidney normal; the other kidney was slightly fatty. The lungs were deeply "congested," thus causing her death.

In the opinion of the writer, the following comment may be offered. This operation was performed in New York City during February. If the janitor and friend referred to were at the patient's house (the original article is by no means definite on this point), the patient was allowed to go home a very short time after recovery from the anæsthetic. This exposure must have been, as in Saundby's case, a very important, exciting feature in the issue of pulmonary congestion, coupled, of course, with the basis laid for the lesion by the ether itself.

CASE IV.—HUTCHINSON (*Lancet*, 1885 vol. i, page 178). Male; aged sixty-two years; January 14, 1885, for reduction of old shoulder dislocation; carried out in the Out-Patient Department of the London Hospital in the winter-time. Ormsby inhaler used, air-cap slightly open; induction of anæsthesia within the usual time. The reduction of the dislocation was not satisfactory, so that the anæsthesia was resumed for a short time with whatever ether was in the inhaler. The patient now began to look pale and to breathe very feebly; brandy hypodermatically was administered over the heart. The tongue was drawn out and artificial respiration was begun. Electricity was used to the nerves of the neck; duskiness of the skin increased and efforts at artificial respiration

failed of result, although continued for a half hour. Upon the removal of the inhaler the second time, there was at first no anxiety; there had been struggling during the first administration, but none during the second. No food had been taken, and no lung trouble was admitted by the patient, although he was evidently short of breath. The autopsy showed emphysema of the lungs, congestion, bronchitis, and mucus in the bronchi; the lower lobes did not contain much air, and there was more œdema in the upper parts. The trachea was congested and contained frothy mucus; the heart was fatty, the pericardium was adherent, the other organs were healthy. The pathologist thought death was due to fatty heart and emphysema. The patient had not been well for some time before, and had fainted not long before applying at the hospital.

This operation also seems to have taken place in the winter-time. It is possible that the exposure, unavoidable in an Out-Patient Department, may also have been a cause of the œdema.

CASE V.—JACOB (*British Medical Journal*, 1885, page 887), in a table of deaths under anæsthetics, notes the following: Female; aged sixty-four years; ovariectomy; death seventeen hours after operation with symptoms of pulmonary œdema; no autopsy.

CASE VI.—E. GURLT (*Archiv für klinische Chirurgie*, Band xlvi, page 273), quoting Trendelenburg. Female; aged thirty-five years; cholecystenterostomy; narcosis one and a half hours; normal but with appreciable salivation and repeated vomiting (method of administration omitted); upon coming out of the ether loud mucous râles were heard in the trachea and bronchi over both sides; the symptoms grew worse; death occurred thirty-two hours after narcosis, apparently of œdema of the lungs. On the next day after the operation the condition was difficulty in expectoration on account of the abdominal wound. Trendelenburg adds that it is doubtful whether the ether caused the death; the patient had carcinomatous lymph-nodes in the abdomen, perhaps secondary to a tumor of the pancreas. She may have suffered from pulmonary metastases. No autopsy was allowed.

CASE VII.—GRANT MORRIS (Proceedings of the Society of Anæsthetists, *Lancet*, May 7, 1898) reported as follows: Female; thirty years old; pain in the region of the left kidney; cachexia; trace of albuminuria on admission, but none on the day of operation; exploratory laparotomy; ether from Clover's inhaler, not pushed, taken normally; slight cyanosis; much frothing at the mouth towards the end of the operation. No alarm occasioned. Patient taken from the table after sixty-five minutes still cyanosed; respiration unimpeded but shallow and sighing; appeared about to vomit; no evidence of obstruction to breathing; conjunctival reflex present; pupils equal and contracted. In fifteen minutes became ashy pale; first the respiration and then the pulse ceased; artificial respiration brought away much frothy, watery secretion. The autopsy showed lungs full of frothy secretion. Death due apparently to failure of respiration from acute œdema of the lungs set up by the ether. There was no hemorrhage into the medulla.

CASE VIII.—In the discussion at this meeting, SILK said he had witnessed a similar case; much ether had been inhaled; the lungs were water-logged from acute œdema. He stated that in his opinion artificial respiration is dangerous in these cases.

CASE IX.—At the same meeting, DR. STARLING thought that renal diseases might be a feature in producing acute œdema of the lungs, and instanced a case supporting this view.

CASE X.—POPERT (*Deutsche medicinische Wochenschrift*, 1884, 37, pages 719 to 722). Male; forty-six years old; farm-hand; previous good health; no cough; long-standing alcoholic habit, moderate in degree for one and a half years previous to admission. Admitted May 20; right inguinal hernia in the early stages of irreducibility and inflammation; medicinal treatment until May 31. Ether narcosis; radical operation for irreducible inguinal hernia; small abscess in the sac and recent adhesions; no perforations; wound packed; no bowel reduced into the abdomen. Narcosis lasted thirty minutes; 130 cubic centimetres of ether used; Czerny's, then Juillard's mask employed; anæsthesia slight; sub-conscious movement; slow, strong pulse; slight cyanosis; regular respiration; one emesis of gastric mucus; mucus râles toward the close of narcosis; prompt recovery of consciousness; no immediate complications; after more than an hour increasing dyspnœa with loud râles, frequent cough, and much mucous sputum appeared. The pulse was so strong that no stimulants were needed, and the diagnosis was rendered of unusual accumulations of mucus, which the patient, being fully conscious, was expected to cough up for himself. (There is no note of any physical examination of the chest.) Rapid heart failure with progressive cyanosis, accompanied by large quantities of blood-stained mucus in the nose, mouth, and throat, appeared, and death supervened during manifest œdema of the lungs.

The autopsy was held on the day of death and showed generalized peritonitis with recent adhesions, two intra-abdominal abscesses, hernial canal admitted several fingers. Contents of sac adherent; normal heart; slight aortic sclerosis; lungs slightly emphysematous, very markedly œdematous; the trachea and bronchi were filled with blood-stained, watery mucus. The other organs were normal. The cause of death was assigned as acute œdema of the lungs.

No note is given of treatment directed against the œdema of the lungs, hence no one may say whether or not it was suspected until its discovery was too late to be of value to the patient.

CASE XI.—RIEDEL, quoted by E. Gurlt (*Archiv. f. klin. Chir.*, xlviii, page 264). Male; forty-four years old; admitted November 11, 1893; previously healthy, excepting abdominal pains progressing steadily and not relieved by lavage; no jaundice; powerful, well-nourished man; normal temperature; normal urine; emphysema; normal heart; tenderness over gall-bladder. Operation, November 12, 1893; exploratory laparotomy under morphine and ether (quantity and inhaler not stated); narcosis forty-five minutes long, with great cyanosis; recovery prompt, with

mental disturbance; pulse 80, regular, full, strong; rather feeble respiration.

November 13, about the same general condition, excepting increased mental disturbance; no vomiting; no abdominal pain; spontaneous urination; in the afternoon, pulse 96, weaker than before, but still rather strong; food refused; death thirty-three hours after operation. Autopsy on November 14 showed emphysema, œdema, early infiltration on the surfaces of the lungs; atheroma of aorta, shortening of one aortic valve, narrowing of coronary arteries, slightly fatty heart.

Gurlt considers this case one in which œdema of the lungs was important. No note is given of the manner in which the ether was given, and none of measures adopted to combat the œdema. The latter fact, and the absence of statement of signs of the œdema during life, raise the question whether, after all, this condition was so etiologic as Gurlt in his table describes.

CASE XII.—J. KAARSBERG (*Centralbl. f. Chir.*, 1896, page 337), June 16, 1889; female; ovariectomy; anæsthesia forty-five minutes long; 150 cubic centimeters of ether (inhaler not stated); normal narcosis; cessation of respiration during dressing; easy artificial restoration, but prompt recurrence of cessation after a few spontaneous respirations; for seven and one-half hours artificial respiration was continued, then death; pulse continued strong up to within an hour of death, when râles and cyanosis demanded venesection; no return to consciousness; autopsy showed œdema of lungs; fatty heart; senile atrophic kidneys (brain examination for lesions of the fourth ventricle not reported).

CASES XIII and XIV.—ROSLING-HANSEN (quotation, *Centralbl. f. Chir.*, 1896, page 338) reports two cases of fatal œdema of the lungs secondary to ether narcosis for placenta prævia. Great anemia was present in each instance, so that the author raises the question as to whether the anemia or the ether was the more potent factor, and concludes that the ether was the cause, because anemia cannot be regarded as having that relation to œdema of the lungs. No report is given of means adopted to treat the œdema.

CASES XV and XVI are the author's patients with piles and eclampsia respectively, discussed previously.

CONCLUSIONS.

Mere tabulations of the important elements in monographs of this character very rarely have definite value. It is hoped, however, that the grouping into paragraphs of the rather essential details will be instructive and serve as a suitable termination of the paper.

1. The *quantity of ether* used in six cases in which this particular is stated averaged 4 ounces. The extremes were

1 ounce and 6 ounces. In Case VIII "a large amount" was used. No quantity is given in IV, V, VI, VII, IX, XI, XIII, and XIV. The quantity of drug employed is, provided the limits of intoxication are not approached, of comparatively little moment. The best measure of the amount of ether to be used is the patient himself as regards his symptoms and not a glass graduate. Thus it is certainly possible to overwhelm a patient with a few ounces, which would scarcely affect a very similarly constituted individual. The proper procedure is steadiness of increase of the concentration and deliberation in the presence of even slight difficulties. Incautious haste (merely to save time which should properly be devoted to securing the patient's safety) and rapid concentration of fumes mark the course of danger.

2. The *form of inhaler* was the bag-type (improperly called "closed" method, properly called "regulable" method, because the valves allow of perfect adjustment to the indications) in II, IV, VII, XV, no inhaler at all as such in I, and is not stated in III, V, VI, VIII, IX, XI, XII, XIII, XIV. Czerny's and Juillard's masks were used in X, whose precise nature cannot be determined through the New York dealers.

The control of conditions by means of the valves and the warming of the ether fumes by means of the bag make the regulable or bag inhalers by all means the safest and best. In the hands of the indifferent, however, undue concentration of fumes may be rapidly and intensely attained. No one therefore should begin to employ these inhalers without careful study of their mechanism first, and, second, instruction from an expert. It is possible by haste, carelessness, and inaptitude to render the position of a patient in any narcosis one of danger, no matter what inhaler is employed.

3. *Recovery of consciousness or "from the ether"* is stated to have been complete in I, II, III, X, XI, XV, incomplete in VI, and is not noted at all in IV, V, VII, VIII, IX, XII, XIII, XIV. It is possible to argue from the number of prompt restorations of consciousness that true intoxication with ether is not by any means an essential to the œdema, and

it is also fitting, therefore, to repeat that manner of administration and other circumstances in the management of the narcosis and convalescence are the etiologic factors.

4. *The nature of the operation*, probably of no moment, excepting when the air passages themselves are being invaded, was reduction or other invasion of joints in I, II, III, IV, laparotomy in V, VI, VII, XI, XII, herniotomy in X, mid-wifery (pacentia prævia) in XIII, XIV, not stated in VIII and IX, piles in XVI. It is well to note that two (III and IV) of the joint cases were treated in out-patient departments, where exposure to cold is almost unavoidable, and one (II) was confessedly very greatly subjected to check of perspiration and change of temperature. It is thus worth while to repeat that too little attention to this protection is given by surgeons, assistants, nurses, and other attendants. Operations under ether in out-patient departments are probably very dangerous on account of the conditions of temperature and ventilation.

5. *The average duration of life after the operation* was eleven and three-fourths hours in seven cases; the extremes were one and one-third hours and thirty-three hours. Unsatisfactory or no statement on this point is given in IV, V, VIII, IX, XI, XIII, XIV.

6. *Age and sex* are, as in all narcosis, of little importance excepting as they are concerned in the diseases most common to the various periods of life and to the two sexes. The average of 12 stated ages of these patients was 41 years and the extremes were 19 and 64 years; the females numbered 7 and the males 5. Age and sex are not given in 4 reports.

7. *Previous good health* is stated to have existed in Cases X, XI, and XV; ill health in reports I, IV, VI, XIII and XIV, while notes on this point are wanting in histories II, III, V, VIII, IX, and XII. This detail does not take in autopsy findings.

8. *The forms of ill health, independently of post-mortem examinations*, are given as "not vigorous" in I; evident dyspnoea in IV; carcinomatous lymph-nodes secondary to cancer of the pancreas in VI; nephritis in VII (?), IX; anæmia sec-

ondary to hæmorrhage of placenta prævia in XIII and XIV; and piles in XV.

The reporter of XIII and XIV thinks anæmia of little importance in these cases. The writer, however, while instructing the members of the house-staff at the Roosevelt and Polyclinic Hospitals never has seen an anæmiac do well if the ether or chloroform be carelessly handled. The depression of the anæmia multiplies susceptibility to all drugs, and thus that to the dangers of anæsthetics.

9. The *autopsy findings* were as follows: Disease of the pericardium, heart, arteries, and valves, was in some form present in I, IV, X, XI, XII; disease of the pleura, lungs, trachea, and bronchi (other than œdema) was in some degree proved in I, IV, X, XI; disease of the kidneys of distinct form was established in III, XII; disease of the abdominal viscera, including hernia and peritonitis, but excluding the kidneys, was in some type present in I (displacement by deformity) and X. Lesions of the brain were found on autopsy in II, pronounced absent in VII, and were not sought, though possibly present, in XII.

10. *Œdema of the lungs* was diagnosed as a distinct entity by physical examination and clinical signs in I, XV, II, III, V, VI, IX, X, XII, XIII, XIV; by autopsy in III, IV, VII, X, VIII (by inference), XI.

Œdema of the lungs is regarded as the chief cause of death in II, III, VII, and may possibly have been such cause in I, IV, VIII, IX, X, XI, XII, XIII, XIV. Notes in V and VI are too fragmentary for classifying.

Œdema of the lungs though present was not fatal in XV.

11. No *treatment* is stated in II, V, VI, IX, XI, XIII, XIV. *Treatment of the œdema* was venesection in I and XII; dry cupping in I and XV; free cardiac and respiratory stimulation in I, III, IV, and XV; artificial respiration in IV, VII, XII; electricity to the nerves of the neck in IX; stimulation of pulse was omitted intentionally in IX; artificial respiration is regarded as dangerous in VIII; an opinion concurred in by the writer, because it serves only to pump the serum from the ves-

icles into the bronchioles and bronchi, where it simply clogs the main channels of the air current. Elevation of the foot of the bed moderately at first and then fully is stated to have been used only in XV. Stimulation of the pulse with arterial dilatation is stated to have been employed only in XV. Dilatation of the pulse with *veratrum viride* was carried out only in XVI, the case of eclampsia.

The deductions from these facts which may be drawn are that the best treatment of the œdema is active dry cupping, and of the circulation in asthenic cases is free use of nitroglycerin and strychnine, elevation of the foot of the bed moderately at first, later fully, and of the circulation in sthenic cases is venesection or judicious use of the aconite group.

The *best prophylactic measures* are certainly deliberate uniform administration and the most adequate possible protection of the patient from draughts and changes of temperature during the stage of perspiration in convalescence.

EXCISION OF PORTIONS OF THE CHEST WALL FOR MALIGNANT TUMORS.¹

BY EMMET RIXFORD, M.D.,

OF SAN FRANCISCO, CALIFORNIA,

Professor of Surgery in Cooper Medical College.

MALIGNANT growths of the chest wall as seen clinically are chiefly of two classes, carcinomata, secondary to primary tumors of the breast, or sarcomata (including endotheliomata) arising from the ribs, periosteum, skin, pleura, etc.

In these days of radical operation for cancer of the breast, which is apt to be performed earlier than formerly, the prognosis is far better than it was a few years ago; but still a considerable proportion of cases exhibit regional recurrences in spite of most radical work. These occur frequently in the chest wall itself and at various points along the path of the lymphatics leading from the mammary gland. Such recurrences may form anywhere along the inner side of the ribs or make a chain of nodules reaching to the spinal column, but are more common at the inner ends of the ribs or more accurately of the intercostal spaces where the branches of the internal mammary artery perforate the chest wall, presumably because of the passage here of numerous lymphatics on their way to the mediastinal glands. In two of the cases here reported the local recurrence was in a lymph gland situated in the intercostal space at its inner end.

In a number of instances the writer has seen such local recurrences after radical removal of tumors which had not yet become attached to the chest wall, but were still freely movable, and also in cases where the primary tumor was in distant portions of the breast. It would seem that lymphatic infection at the edge of the sternum is comparable in frequency to that of the axillary glands, which would suggest the systematic removal of all subcutaneous tissues in this region down to the

¹ Read before the American Surgical Association, July, 1905.

perichondrium in all cases of carcinoma of the breast, whether the tumor be in the internal or external portions of the mammary gland.

In a certain proportion of cases these recurrences are local when discovered and may be successfully removed. The removal, however, requires resection of considerable areas of the chest wall, including all of its structures and entails opening of the pleural cavity on that side together with plastic closure of the defect.

It may be stated more broadly that regional recurrence after radical operation for carcinoma of the breast is very apt to involve the chest wall, and if such a nodule is to be successfully removed the underlying portions of the chest wall must be removed with it. This follows because in the modern radical operation for carcinoma of the breast practically all the subcutaneous tissues are removed from the whole breast area down to the periosteum and intercostal muscles, and any recurrent nodule growing beneath the skin may be considered to have invaded the intercostal muscles by the time it has become large enough to be detected. This is quite as true where the recurrence is the result of scattering of cancer cells in the connective tissue spaces as in purely lymphatic recurrence. Lenticular skin metastases in their beginnings are an exception to this rule.

Mr. Jacobson advises operation in such cases, which he says may be done with the expectation of at least delaying general infection with the disease. He reports one case, however, in which the patient was free from recurrence two years after resection of the chest wall.

Sarcoma of the chest wall may arise in any of the structures from the skin to the pleura, but the more common varieties grow from the ribs or their cartilages or the periosteum. The operative relations of sarcoma are not materially different, save for the fact that some of the varieties are encapsulated. Infiltrating sarcomata require the widest and most radical removal, while the encapsulated tumors and particularly the desmoids and the giant-celled sarcomata and often the

endotheliomata may be enucleated. Still even here the section should be made well outside the capsule since such capsules are themselves often infiltrated.

The following statement of the technique to be employed in such cases is based upon the experience obtained in the cases here reported:

A wide skin incision is made of such shape as to be readily closed by some simple plastic procedure. A curvilinear triangle answers admirably.

The chest is then opened through an intercostal space at some distance from the tumor sufficiently to permit of exploration of the inner surface of the ribs in the neighborhood of the tumor. By this means much can be learned of the extent of the growth and the presence or absence of involvement of the lung or pericardium. This will determine the area of chest wall to be removed. Of course it is of the greatest importance to take out the tumor in one piece without section of tumor tissue, but in some cases this may not be possible.

The ribs are first cut on the outer side, *i.e.*, the side of greater fixation preferably without cutting the pleura. By this means the intercostal arteries can be most readily caught by means of a curved needle carrying a catgut ligature. Further advantage lies in the fact that if the pleuroperiosteal section be made a little nearer the tumor than the bone section, the flap of periosteum and pleura will offer some protection to the lung from the sharp edges of the ribs.

In these cases there were no untoward symptoms incident to the production of pneumothorax. It was noticed, of course, that the respiration became immediately deeper and more rapid as soon as air entered the pleural cavity, but, aside from the violent flopping of the heart from right to left, terrifying to look at but without noticeable effect on the pulse, there was no special inconvenience to patient or operator. This is quite in accord with the statement of Dr. Park (*ANNALS OF SURGERY*, 1887) that one side of the chest may be operated upon without resort to artificial respiration, and with the work of other surgeons. A notable operation by Koenig, quoted by Park

(*Arch. f. klin. Chir.*, 1902, vol. xlvii, p. 314), might be mentioned. Trzebicky, in 1902, reported five extensive operations on the chest wall for the removal of tumors done without artificial respiration. This statement of Park may be worthy of reiteration here in view of the numerous apparatuses which have been devised to overcome the effects of the artificial pneumothorax. Doubtless Fell's apparatus and the Sauerbruch cabinet are of value in special cases, the latter essential in cases where there is likelihood of both sides of the chest being opened, but resection of the chest wall in the usual case can be done satisfactorily without these appliances. Dr. Keen reported a case in which he had removed a large sarcoma of the chest wall, and when the chest was opened he had tried to use Fell's apparatus without tracheotomy. The apparatus did not fit the face well and was discarded, and the operation completed without the occurrence of serious symptoms. The idea of Delagenierre that the chief danger in operative pneumothorax lies in the suddenness of its production (which led Dollinger to the establishment of an artificial pneumothorax under local anæsthesia twenty-four hours or so before performing an operation on the chest wall) is probably of considerable meaning and worthy of serious consideration. Probably, however, most of the advantages of Delagenierre's principle can be obtained during the anæsthesia by allowing the air to enter the pleural cavity only slowly, giving the system reasonable time to accommodate itself to the new condition.

In the cases here reported the writer found that the respiration could be greatly modified, and the tremendous lateral excursions of the heart and mediastinal tissues almost completely checked by the simple procedure of stopping up the opening in the chest wall with a wet towel. The towel, folded into two or three thicknesses, is made to slip beneath the partially loosened section of chest wall which is to be removed, and is drawn forward as new cuts are made. It is important to close the opening at the moment of complete expiration when the chest is largely emptied of air. When this was done the lung expanded and the exaggerated and fatiguing expiratory

efforts were at once quieted. When by gradual leakage considerable amount of air had accumulated in the cavity, the towel was readjusted and closure made again at the moment of complete expiration.

In those cases where the tumor was at the edge of the sternum, it was found convenient after cutting the ribs to raise the tumor to the inner side, bending the costal cartilages to permit of work beneath. The internal mammary artery was readily caught above and below by passing about it a curved needle armed with catgut and was tied before being cut. The section of the sternum was made with bone shears and included about half its width.

Removal of the tumor in several cases gave excellent exposure of the upper pericardium and of the mediastinum which in one or two cases showed enlarged glands which were readily removed with the surrounding fatty tissue.

The wounds were closed in each instance by a large skin flap lifted up from some convenient region, generally the upper abdomen where the laxity of the skin permits ready closure of the defect. In one case a flap was taken from the opposite side of the chest, the very full breast being held towards the median line with adhesive plaster: this with reference to Dr. Richardson's notion of using the opposite breast to assist in closing the large wound left by the radical operation for carcinoma of the breast. The amount of air left within the chest was made much less by letting it out during expiration and preventing its reëntrance by means of the closing flap, which to this end should be made somewhat larger than the opening in the chest wall. Absorption of the air was rapid so that in very few days the remaining pneumothorax was not demonstrable.

It was feared that the aspirating action of the lower pressure on the raw inner surface of the occluding skin flap would cause exudation in embarrassing amounts into the pleural cavity. This did not occur, however, unless in one case where a dulness was made out within a few days, but in this case there must have been some degree of infection, as the patient had a temperature of 100° to 103° F. for a week, and aspira-

tion failed to demonstrate fluid, probably a localized pneumonic process with pleurisy.

In all of the cases the respiration remained more rapid than normally for a week or more, for which I think the soreness incident to the movement of the ends of the ribs in the unhealed wound is quite as accountable as the remnant of pneumothorax.

The final condition of the wounds was satisfactory in all of the cases. Wide-spread but weblike adhesions were sufficient to prevent collapse of the lung during that operation in one case where a second operation was performed.

I would report five cases of resection of the chest wall for recurrent carcinoma of the breast in four patients and one of removal of the clavicle and first rib and portion of the sternum for sarcoma which in point of operative technique presented a number of similar conditions.

CASE I.—*Recurrent Carcinoma of Breast over Fifth Rib; Resection of Fourth and Fifth Ribs; no Evidence of Recurrence after Two Years.* Reported by courtesy of Dr. Stanley Stillman, of San Francisco.

Miss C. had been operated upon in 1899, at age of twenty-seven, by Dr. Lund, of Boston, for carcinoma of the right breast. In 1900 a recurrence in the scar was removed by Dr. Lund, in San Francisco, and in 1901 patient presented a hard, flat, immovable tumor about five centimetres in diameter situated over the fifth rib just outside the epiphysis. X-ray treatment was used three times a week for eighteen months. For a time the tumor grew smaller, then it began to increase in size, and radical removal was determined upon. Dr. Stillman removed some 5 centimetres of the fourth and fifth ribs with the adjoining intercostal tissues. Though the tumor projected through the chest wall, there were no adhesions to the lung and no mediastinal tumor was made out. The opening was closed by a skin flap lifted up from the abdominal wall. Recovery was rapid and uneventful. Patient was seen July 1, 1905, two years after operation, and showed no evidence of recurrence, but was in perfect health.

CASE II.—*Recurrent Carcinoma of Breast at Edge of Sternum; Resection of Fourth and Fifth Costal Cartilages with Edge*

of Sternum; Recurrence in Mediastinum after Eight Months; disappearing under X-ray, but reappearing Five Months Later.

Mrs. W., aged sixty-six years, had been operated upon by the Halsted method in January, 1902, for carcinoma in the outer upper quadrant of the right breast, which had been noticed for a year, and which had begun to invade the skin and had produced a large axillary tumor. In the operation everything had been removed from the edge of the latissimus dorsi to the sternum and from the first rib to the tenth. The skin wound was so wide as to require swinging flaps to effect closure. In November, 1903 (twenty-two months later), patient returned with recurrent tumor in the scar at the edge of the sternum over the fifth costal cartilage, $2 \times 3 \times 1\frac{1}{2}$ centimetres in diameter, sharply outlined, but fixed. There was no evidence of axillary or other recurrence, and the patient being in good physical condition it was determined to remove that portion of the chest wall carrying the tumor. A curvilinear triangular incision 7 centimetres on each leg was made and a skin flap lifted up from the upper abdominal wall sufficient to close this defect. The pleura was opened enough to admit the finger, which showed that the tumor was of about the same size on the inner surface of the ribs as on the outer, but did not involve the lung. An area of chest wall about 7 centimetres in diameter was removed as described above. During much of the dissection the pleural opening was closed more or less perfectly by the hand of an assistant or by a wet towel, by which the respirations were kept quiet and but little deeper or faster than the normal. The skin flap was stitched in place over the opening with silk-gut sutures and the edges accurately approximated with catgut. Before sealing the wound, a pair of forceps was introduced between the stitches and the greater part of the air let out of the chest, the forceps being quickly withdrawn at the end of expiration. Immediately after the operation the respirations were 22, but as patient regained consciousness they increased to 40, probably as a result of soreness. On the second day they were 28 and remained at 30 for several days. On the eighth day the wound was dressed for the first time; it had healed by primary union save for slight redness of the wound edges, and on the eleventh day the stitches were removed, patient leaving hospital on the nineteenth day. On the

sixteenth day a few drops of pus appeared in the abdominal portion of the incision.

In September, 1904, patient returned, showing two pea-sized recurrent nodules beneath the skin in the mediastinum. Further operation was deemed useless and patient was referred to the X-ray department of Lane Hospital for treatment. After 20 treatments by Dr. Lehmann during eight weeks, the nodules were no longer palpable, and patient returned home. In February, five months later, I was informed by letter that one of the nodules had begun to enlarge again, and that patient was very weak, probably from internal metastasis.*

CASE III.—Recurrent Carcinoma of Breast at Edge of Sternum; Resection of Third and Fourth Costal Cartilages with Half of Breadth of Sternum; Recurrence in Original Scar apart from Field of Last Operation; Pleural Carcinoma; Death from General Carcinosis Five Months Later.

Mrs. D., aged forty-five years, was operated on in February, 1903, by Halsted's method for a large spherical, rapidly growing carcinoma of the left breast with large axillary tumor; patient was very fat and had noticed the growth only five months before. In July careful examination failed to show any recurrence. In November several small nodules were discovered in the lower anterior part of the scar and were excised, the dissection going only to the periosteum. In March, 1904, two other recurrent nodules were found at the border of the sternum in the original skin, the flap of the last operation remaining free. As in Case II, the region about these nodules, 12 centimetres in diameter, was excised. One of the nodules was seen to penetrate into the fourth intercostal space. The patient being in good condition the pleura was opened through an intercostal space nearby and the inner surface of the wall examined with the finger. The tumor did not appear to have penetrated to the pleura, and the lung was free, but an enlarged gland was detected at the edge of the mediastinum.

The fourth and fifth costal cartilages were then cut away, the internal mammary artery tied and cut, and a section of the sternum $1\frac{1}{2} \times 5$ centimetres removed. A second enlarged gland in the mediastinum was removed with the fatty tissue about it. Because of the retraction of the lung, a large area of the chest

* Reported to have died August 13 of cerebral hemorrhage.

wall was exposed to view, but no further recurrences were evident. After operation the pulse was 96 and respiration 30, but patient complained of very great pain. For the next week there was considerable fever, 99° to 103° F., pulse 90 to 110, with a good deal of pain, evidently a septic pleurisy or superficial pneumonic process. On the fourth day patient was more comfortable and sat up in bed. Some dulness was detected, presumably from effusion. On the eleventh day stitches were removed and a small abscess evacuated in the abdominal part of the incision. On the eighteenth day patient left hospital, respiration still 30, pulse 110. In May, two months later, patient returned with small recurrence external to last operation, and with wide dulness over left chest. Several punctures with needle brought no fluid, the dull area being probably caused by pleural carcinoma; further operation was out of the question. Patient died in July, four months after the resection of the chest wall and seventeen months after the Halsted operation, twenty-two months after patient first noticed the tumor.

CASE IV.—*Recurrent Carcinoma of Breast at Edge of Sternum; Inner Ends of First and Second Ribs and Portion of Sternum and Mediastinal Glands removed; Internal Mammary Artery tied at its Origin; Further Recurrence below; Resection of Third and Fourth Ribs; Patient well Six Months after Last Operation, Twenty-two Months after Halsted Operation.*

Mrs. M., aged fifty-three years, was operated on by Halsted's method in August, 1903, for a large suppurating carcinoma of the upper outer quadrant of the left breast with large axillary tumor. Patient was very fat, had noticed the tumor but four months before. This had been incised by the family physician for infection, suppuration continuing, and tumor grew out of the incision. After the operation much of the flaps used to close the incision about the drainage tubes sloughed and the resulting raw surface was so large as to require the application of Thiersch grafts, which was done as soon as the suppuration permitted. In August, a year later, patient returned with recurrence, 3 centimetres in diameter at the edge of the sternum, over the second intercostal cartilage. The tumor was widely circumscribed, the second rib cut across, opening the pleura 5 or 6 centimetres external to the border of the sternum and the internal mammary

secured by double ligatures in the second intercostal space and divided between. The first rib was then similarly cut and the sternum divided with bone forceps from below nearly in the middle line and as far as the level of the sternoclavicular joint. The mass was then turned upward to give access to the upper portion of the internal mammary artery, but it was not found practicable to secure the artery as high up as was desired, so it was caught in forceps in the first interspace and freed from the first rib. The tumor mass with first and second ribs, portion of sternum and sternoclavicular joint, was removed. It was then a simple matter to tie the internal mammary artery well above the position of the first rib and to remove the pleura and other tissues which had been in proximity to the tumor. The wound was closed with a large flap lifted up from the right side of the chest.

The patient was somewhat cyanotic during the early part of the operation (patient was very fat and had her chest cavity still further compressed by abdominal fat), but the pulse remained strong and regular. Through a considerable part of the operation the pleural cavity was well enough closed with a wet towel to permit of considerable expansion of the left lung, and when the towel was used the respiration was markedly quieter and approximated the normal.

After the operation the pulse was 82 to 100 and the respiration about 30. Primary union occurred and patient left hospital on the twentieth day. In the following November patient returned, but showed no evidence of recurrence. She was strong and well and able to do hard work. In January a small nodule was found at the edge of the sternum in the third intercostal space. A second resection of the chest wall was therefore done, since there was no sign of other recurrence, in which the third and fourth ribs and edge of sternum were removed. Gauzy but widespread adhesions of the lung to the parietal pleura prevented collapse of the lung so that the operation was much simpler than the previous one. It was interesting to note the demonstration of the portion of the heart which is uncovered by pleura, for this was beautifully shown when in expiration, the lung being confined by adhesions bellied forward all around this area.

On September 2, a third resection of the chest wall was done, this time for a recurrent nodule on the opposite side of the sternum. The inner ends of the second, third, and fourth ribs were

removed with the intervening soft parts as well as the sternum for its entire width and from the clavicular joint to the attachment of the fifth costal cartilage. Attached to the sternum and removed with it was a mediastinal tumor the size of a walnut. Considerable fatty tissue of the mediastinum was taken with the tumor, the dissection exposing the aorta. No serious symptoms resulted from the acute pneumothorax on the right side as the left lung in spite of the pleural adhesions and lessened mobility of the chest wall resulting from the previous operations gave sufficient breathing tissue. The wound was closed by a transplanted skin flap and the patient made a rapid recovery, leaving the hospital on the 18th day.

CASE V.—*Sarcoma of Clavicle involving First Rib and Sternum, with Large Mediastinal Tumor; Resection; Recovery, Patient being Well and Strong at the Present Time, Eleven Months after the Operation.*

W. H. H., aged seventy years, teamster, presented a large tumor at the base of the neck on the left side, fixed to and probably originating in the clavicle. Two years before he had injured the collar-bone, and three or four months afterwards noticed a small tumor near the inner end of the clavicle. The tumor continued to enlarge till it reached the size of about 10 x 15 x 8 centimetres, the long diameter being vertical. It covered the sternoclavicular joint and extended well up on the neck and over the upper chest. The skin contained many dilated veins, but was movable over the tumor, which was smooth in general outline, though coarsely lobed. Patient's general physical condition was excellent.

On August 16, 1904, under chloroform, the skin was incised, the edge stripped back, and the clavicle exposed and cut at the junction of its middle and outer third. The greater pectoral was cut across and the sternocleidomastoid divided about its middle. The clavicle was then tilted upward and the subclavius muscle divided. The first rib was then cut at a point internal to the subclavian vein without opening the pleura, the intercostal muscles cut, and the whole mass turned inward. A large lobe of the tumor the size of a hen's egg projected beneath the sternoclavicular joint into the mediastinum. In dissecting the subclavian vein from the tumor it was punctured near its point of union with the internal jugular. A little air entered, but compression with a gauze pledget sufficed to close the opening during the dissection.

In order to complete the separation of the vessels from the tumor the under side of the ligated external jugular was used as a guide and answered admirably. The internal mammary artery was not adherent to the tumor, but was lifted off it with the parietal pleura.

Because of the great depth to which the mediastinal lobe of the tumor extended, the uncertainty as to the quantity and character of adhesions of this lobe to the important structures of the mediastinum and the great difficulty of dissecting beneath so large a tumor, it was impracticable to complete the operation without dividing the tumor. Accordingly, the greater mass of the tumor was torn across and then section of the sternum was made with bone shears. The remainder of the tumor was then removed without difficulty.

While the pleura was not opened in this operation, the upper portion of the pleural sac was so widely freed from its parietal attachments that there was almost as much interference with the respiration as if the pleura had been opened and the bulging of the pleura into the wound with every expiration was annoying.

Whenever the pressure on the subclavian vein was released air would enter, and this occurred four or five times, but the quantity was small and it seemed to make no difference with the patient's breathing or pulse. The opening was finally closed with fine silk suture and fortified by a flap of fascia stitched over the suture line. The thoracic duct was not injured, as it probably would have been had not the external jugular been used as a guide and all the dissection carried on in front of it.

The wound was closed with drainage. Patient made a rapid recovery, being out of bed on the seventh day and leaving the hospital on the twelfth day.

At the present time (July 1), eleven months after operation, patient is continuing at his work as teamster, and his physician writes that he is well, having withstood an attack of grippe which tried his lung and shoulder in the coughing. There is no sign of recurrence as yet. Histologically, the tumor was an endothelioma.

In recapitulation, the writer would hazard the opinion that, although, to quote Watson Cheyne, "The patient's chance is in the first operation," there is still some chance for a certain proportion of cases with recurrence in sufficiently radical resection of the chest wall. Recurrences of the sort indicated are apt to be developed from remnants of the original tumor and

may in themselves be purely local. Radical dissection of the axilla is frequently followed by freedom of recurrence in that region because of the interruption of the process of metastasis by the lymph-glands. May not, in certain cases, the same thing be true of removal of infected lymph-glands of the chest wall and anterior mediastinum?

The artificial pneumothorax, if unilateral, presents no dangers sufficient to constitute contra-indication to the operation in patients well enough otherwise to warrant operation. The fatiguing respiratory efforts which supervene when the chest is opened may be almost entirely done away with by the use of a wet towel, covering the opening during the dissection.

As for results, it may be stated that of the six operations (including that of the sarcoma) there was no mortality, although most of the patients were well along in years, the ages at the time of the resections being 40, 46, 54, 68, and 70, with average of 55, and all except the sarcoma case having undergone radical Halsted operation, three cases within a year, the fourth within two years.

Of the four cases of recurrent carcinoma, one is dead four months after the operation (the tumor in this case was one of more than ordinary malignancy and rapidity of growth); one had further recurrence in the mediastinum after eight months, which disappeared under the X-ray but reappeared five months later, though patient is still living twenty months after the operation and twenty-eight months after the original Halsted operation; one had further recurrence in the next lower intercostal space for which a second resection was done in January last and is at present, six months later, free from recurrence, eleven months after the first resection and twenty-two months after the Halsted operation, and, finally, one is free from recurrence two years since the resection. (Case of Dr. Stillman.)

It is fair to state that in all of these cases but one, life has been prolonged, but it is still too soon, of course, to say whether any of the three cases which are to-day free from recurrence will remain so.

NON-PARASITIC CYSTS OF THE SPLEEN.¹

BY CHARLES A. POWERS, M.D.,

OF DENVER,

Professor of Surgery in the University of Denver.

OUR knowledge of this subject has a twofold origin: First, the few and comparatively recent clinical reports; and, second, the somewhat more numerous accidental autopsy findings. The results of these two sources of information do not seem to agree, and, as will be seen later, it by no means follows that the two are intimately related, for the discovery, *post-mortem*, of a number of small, latent, cystic formations in a spleen does not seem to necessarily bear on the fact that in certain rare cases patients suffer during life with a formidable hæmatoma which originates in the spleen and demands surgical relief.

Up to 1904 the subject was practically ignored by writers, but that year witnessed the publication of not less than three monographic articles, each written in ignorance of the efforts of the other authors. These articles are by Heinrichius (*Arch. f. klin. Chirurgie*, 1904, lxxii, 138); Monnier (*Beiträge z. klin. Chirurgie*, xli), and Laspeyres (*Centralblatt f. d. Grenzgeb. d. Med. u. Chirurgie*, 1904). Heinrichius's article is the most comprehensive, as it deals with both clinical and autopsy material. Monnier's paper has to do only with splenectomy cases. Laspeyres devotes a section to the latter in a monographic article on splenectomy in general. The writer presents the subject at this time, first, because he has notes of an unreported personal case, and, second, because, so far as he knows, the matter has not yet received attention in English or American literature. In addition to the author's case, two others are added which seem to have been overlooked by other

¹ Read before the American Surgical Association, San Francisco, July, 1905.

writers, the total being thirty-two. This number by no means represents the frequency of the disease, for Heinrichus cites numerous bare statistics of splenectomies in various clinics which show that this operation has been done a number of times for non-parasitic cysts, although no details are forthcoming. Of the chance autopsy findings collected by the same author, possibly half a dozen were large unilocular hæmatomata which, for some reason, never came to operation. So we may assume that from fifty to sixty of these large cysts have been known to exist; this number might perhaps be increased by correspondence. However, the condition is at best rare, and it may have lost some of its clinical interest from the conclusion reached by authors that it merely represents an indication for splenectomy, an operation the safety of which improves steadily from year to year.



FIG. 1.—Author's case of hæmorrhagic cyst of spleen. Male, 18 years.

In this paper the author will first relate his own case, and then append a brief table of thirty-one other observations, endeavoring to analyze these as they stand.

AUTHOR'S CASE.—In September, 1895, Dr. H. M. Ogilbee, of Manitou, Colorado, kindly referred a young man of eighteen years, who presented a large, left-sided, abdominal cyst (Fig. 1). The mass was of four years' growth; there had been gradual

loss of flesh and strength, anorexia, headache, and general pressure symptoms. Fluctuation was plain. The diagnosis of splenic cyst seemed positive. *Operation*.—St. Luke's Hospital. A free incision was made over the prominent part of the tumor, the walls of which were found to be about one-half of an inch thick, semicartilaginous, and solidly adherent to all adjacent structures. Extirpation seemed impossible. (Later autopsy findings confirmed this.) The single cyst held several litres. Posterior incision, through drainage.

The walls of the cyst did not collapse, and the patient died of septic absorption from the cyst wall on the twelfth day. Autopsy with microscopic examination by Dr. H. C. Crouch, Professor of Pathology in the University of Colorado. Anatomical diagnosis, hæmorrhagic cyst of spleen. From the autopsy findings, the author could not see, as said, how the cyst could have been successfully extirpated.

TABLE OF CASES.

No.	Operator. Reference.	Sex. Age.	Clinical History.	Symptoms.	Treatment.	Result.	Character of Cyst.
1	Péan. Des tumeurs de l'abdomen, i, 1880.	F. 7	.....	.....	First recorded operation, 1863. Opening with caustic and injection of iodine.	Death from peritonitis two months later.	Serosanguineous cyst.
2	Péan. (Ibid.) 20	F. 20	Swelling and pain for two years with recent exacerbation.	Fixed, very painful tumor, fluctuating in places. Diagnosis of ovarian cyst.	Second recorded operation, 1867. Laparotomy followed by recognition of splenic cyst, which, having a pedicle, was readily extirpated after emptying it by puncture and dividing its adhesions. Operation, 1879. Opening with caustic followed by incision.	Recovery. Patient in good health two years later.	Unilocular cyst springing from spleen. Capacity, three litres. Contents, hæmorrhagic.
3	Péan. (Ibid.)	F. 54	.....	Diagnosis of abdominal cyst.	.....	Death in a few days from peritonitis.	Serosanguineous cyst.
4	Marciano and Féreal, Progrès Méd., 1874, p. 262.	M. 38	.....	Diagnosis of malaria with abdominal cyst.	Third recorded operation, 1874. Opening with caustic followed by puncture and use of retention-cannula.	Recovery, with persistence of small fistula three months later.	Serosanguineous cyst.
5	Credé. Arch. klin. Chirurgie, 1883, xxviii, p. 401.	M. 44	Tumor first noticed one year ago. Enlarged slowly; latterly more rapidly.	Tumor size of child's head, slightly tender, fluctuating. Pedicle to left and above. Covered by omentum and intestines. Diagnosis, hydro-nephrosis or cyst of spleen. Movable, fluctuating mass.	Laparotomy, September 25, 1881. Isolation of tumor and evacuation by puncture. Pedicle very short, spleen adherent. Splenectomy. Pedicle buried, wound closed.	Recovery complete after ten and a half months.	Cyst grew from lower half of spleen; contained 1350 cubic centimetres yellow fluid, but slightly albuminous.
6	Thornton. Medical-Chirurgical Transactions, 1886, lx, p. 407.	F. 19	First noticed two years ago.	As suggested by foregoing. Exploratory puncture, evacuation of five litres bloody fluid. Rapid reappearance.	Laparotomy, 1884, and recognition of cyst of spleen. Adhesions divided and spleen extirpated.	Recovery.	One large and several smaller cysts, serosanguineous.
7	Spencer Wells. Brit. Med. Jour., 1889, ii, p. 66.	F. 21	Malarial splenomegaly since childhood. Two years ago tumor noted in ovarian region. Subsequent pregnancy (normal), followed by increase in size of tumor and secondary peritonitis.	As suggested by foregoing. Exploratory puncture, evacuation of five litres bloody fluid. Rapid reappearance.	Laparotomy, May 17, 1888. Cyst ruptured and four or five litres of fluid escaped. Numerous splenic adhesions detached. Resection of cyst wall in part. Drainage.	Recovery. One year later patient well.	.....
8	Fink. Zeitschrift f. Heilkunde, 1890, x, p. 353.	M. 14	Rapidly growing tumor, left upper abdominal region.	Tumor extending from ribs to a hand's-breadth below navel. Nodular, soft, elastic, fluctuating, mobile. Diagnosis of splenic cyst.	Laparotomy, November 10, 1888. Tumor size of child's head, occupying lower half of otherwise normal spleen, resected with thermocautery.	Recovery. Patient well six months later.	Serosanguineous cyst of 1500 cubic centimetres capacity.

TABLE OF CASES.—Continued.

No.	Operator. Reference.	Sex. Age.	Clinical History.	Symptoms.	Treatment.	Result.	Character of Cyst.
9	Bardenheuer, Deutsch. Med. Wochenschrift, 1890, No. 36.	F. 47	.....	Tumor size of child's head, adherent to lesser pelvis. Pain in left side of abdomen. Notable digestive disturbances.	Laparotomy and extirpation of splenic cyst.	Recovery.	Cystic contents thin, and of a dirty, chocolate brown color. Cyst walls fibrous.
10	Terrier, Bull. et Mém. Soc. de Chirurgie, 1892, p. 661.	F. 33	First noticed pain in left side, followed by appearance of tumor.	Tumor at level of umbilicus, size of fist, fully movable, with pedicle. Diagnosis, cyst of omentum or spleen, probably hydatid.	Laparotomy, November 16, 1891. Recognition of splenic cyst, which was punctured and then extirpated.	Recovery. One year later spleen slightly enlarged and tender.	Cyst grew from concavity of spleen. Contained blood.
11	Schaltia, Arch. f. Chirurgie, 1895, xlix, p. 629.	F. 36	Ill for past two years. Tumor noticed five months ago. Presure-symptoms.	Smooth, painless, fluctuating mass, movable below. Absence of hydatid thrill and friction murmur. Diagnosis of hydatid or splenic cyst.	Laparotomy. Extensive adhesions of spleen. Extirpation of spleen after examination of eight litres of fluid and divisions of many adhesions.	Recovery complete.	Spleen nearly transformed into a large serousanguineous cyst.
12	Moreschi and Ghetti, Gaz. degli Osped., 1896, No. 119.	F. 42	Direct violence followed by painful swelling, increasing rapidly in size.	Examined a month after suppression of symptoms. Diagnosis of enlarged and floating spleen.	Laparotomy, August 14, 1896. Splenectomy after division of adhesions with colon.	Recovery.	Serosanguineous cyst on anterior surface of spleen.
13	Bacelli, Il Poli- clinico, 1897, No. 6.	F. 27	Direct violence. Two months later, tumor noticed in left hypochondrium, slowly increasing in size.	Smooth, soft, elastic, and fluctuating mass, attached to lower border of spleen. Movable, and but little sensitive.	Tumor twice punctured, with escape of pure blood. Did not refill.	Recovery. One month later small swelling still perceptible.	Probably a subcapsular hemorrhage of slow development, which disappeared when an outlet was furnished.
14	Heurtaux, Bull. et Mém. Soc. Chi- rurgie (Paris), 1898, p. 928.	F. 27	One year ago noticed tumor, which steadily increased in size.	Large, fluctuating mass occupying three-fourths of abdominal cavity.	Laparotomy. Cyst incised and washed out, then marsupialized.	Suppuration for a year. Injections of iodine, etc. Recovery after lumbar counter-opening and drainage.	Capacity of cyst, 10 litres; contents, bloody, chocolate colored fluid.
15	Baginsky, Berl. klin. Wochenschrift, 1898, No. 2.	F. 12	Swelling of left side shortly after violent fall.	In left hypochondrium, an elastic, fluctuating mass extending across median line. Exploratory puncture, diagnosis of hemorrhagic cyst of spleen.	Operation, May 3, 1896, by Professor Glick. Cyst sutured to peritoneum and skin. An elliptical piece excised from cyst wall. Evacuation of two litres of fluid, cyst cavity tamponed.	Recovery (radical cure in six weeks).	Excised piece of cyst wall showed some normal splenic tissue.
16	Michailowsky, XIII Internat. Congrès, Paris, 1900.	.. ..	Malarial splenomegaly. Trauma.	Traumatic blood cyst of spleen.	Splenectomy.	Recovery.	.....

17	Subbotic. Deutsch. Zeitsch. f. Chirurgie, 1900, liv. p. 437.	F. 40	Malarial splenomegaly, perisplenitis, floating spleen.	Splenectomy for splenomegaly, 1897.	Recovery.	Spleen also seat of small multiple cysts, some serous, others hemorrhagic.
18	Subbotic. (Ibid.)	M. 30	Tumor size man's fist beneath left costal arch. Diagnosis, echinococcus or blood cyst of spleen.	Operation of incision and drainage, 1892. Parietal peritoneum adherent to wall of tumor. Evacuation of 1500 cubic centimetres of bloody fluid and clots. Peritoneum not opened.	Recovery, with small fistula.	Hæmorrhagic perisplenic cyst, from subcapsular hæmorrhage. Eventual adherence to peritoneum.
19	Subbotic. (Ibid.)	F. 21	Tumor larger than a man's fist beneath left costal arch. Adherent to peritoneum.	Incision and drainage, 1897. Escape of two litres of bloody fluid. Clots also in cyst.	Recovery.	Hæmorrhagic perisplenic cyst. Correct diagnosis before operation.
20	Subbotic. (Ibid.)	F. 30	Diagnosis of chronic splenomegaly, with lymphatic cyst at hilus of spleen.	Splenectomy, 1898.	Recovery.	Cyst size of hen's egg close to pedicle of spleen; cavity traversed by septa, wall continuous, with splenic capsule.
21	Leonte. Cited by Heinrichs. See No. 29.	F. 55	Tumor in pit of stomach. Diagnosis, cyst of gastrosplenic ligament.	Splenectomy. Lesion found to be unilocular cyst of spleen with almost complete atrophy of latter.	(?)	.....
22	Reimann. "Ueber Milzsystem" Diss. Leipzig, 1901.	M. 33	Spleen enlarged and irregular in form and consistency. Pressure symptoms upward. Trial puncture brought away old hæmorrhagic fluid.	Operative puncture at repeated intervals. No improvement. Radical operation refused.	No benefit.	Serosanguineous cyst.
23	Routier. XIV Congrès de Chirurgie, Paris, 1901, p. 157.	F. 24	Tumor first noted nine years ago. Gradually increased in size. One year ago began to grow more rapidly.	Resembled floating spleen until alter rapid increase.	Recovery.	Splenic tumor occupied lower half of organ, upper part being normal. Composed of multiple, organized hæmatomata.
24	Lejars. XIV Congrès de Chirurgie, Paris, 1901, p. 158.	F. 43	Tumor first noticed about a year before. Previous history of trauma and severe abdominal disturbances extending over months.	Tumor in splenic area tapped from behind and in front, with evacuation of old hæmorrhagic fluid. Supervention of symptoms of infection led to intervention.	Recovery.	Probable subcapsular hæmorrhage of spleen, with resulting perisplenitis.
25	Dalinger. Medizin. Observed in Der., 1901.	M. 44	Malaria for a year, with very recent acute exacerbation; confined to bed; collapse.	High temperature. Increased splenic dullness.	Recovery.	Subcapsular hæmorrhage of spleen; capsular adhesions. Splenic tissues softened. Blood, partly liquid and partly clotted, was present in the cyst.

TABLE OF CASES.—*Continued.*

No.	Operator. Reference.	Sex. Age.	Clinical History.	Symptoms.	Treatment.	Result.	Character of Cyst.
26	Chavier. Bulletin Méd., 1902, xvi, p. 24.	M. ..	Many years before had a hurt over spleen. Subsequent digestive disturbances. Recent acute exacerbation, violent pain, tympanites.	Diagnosis of intestinal occlusion.	No operation.	Death in two days.	Autopsy showed tumor of spleen, non-adherent. Represented a subcapsular hamatoma with consecutive atrophy of spleen. Tumor much larger than spleen. Death from rupture of stomach. Blood cyst of spleen.
27	Jordan. Centralb. d. Chirurgie, 1903, No. 36.	F. 46	Recently, with good previous history, local and general symptoms and beginning tumor in left hypochondrium.	Bulging in left hypochondrium. Tumor moved on respiration with rough friction-murmur. Appeared to be a cyst; not tender, and some movable.	Splenectomy, 1899.	Recovery.	Capacity of cyst, three and a half litres.
28	Monnier. Beiträge z. klin. Chirurgie, xli, 1903-4, p. 181.	F. 21	Tumor noted shortly before operation. General health good.	Mass reached nearly to pubes. Smooth, tense, freely movable. Uterus and ovaries normal.	Operation, June 12, 1903, by Professor Krönlein. Cyst of upper part of spleen, adherent to surrounding tissues. Puncture brought away bloody fluid. Splenectomy after division of adhesions.	Recovery.	
29	Heinricius. Archiv. f. Klin. Chirurgie, 1904, lxxii, p. 138.	F. 14	Tumor had been growing for four years.	General failure of health; pressure symptoms.	Operation, September, 1895. Incision. Tumor universally adherent. Freely opened, evacuated, and drained. Walls were thick and semi-cartilaginous, and did not collapse.	Recovery. Patient well three years later.	Splenic tumor, cystic; capacity, 800 cubic centimetres; size of child's head; contents, hemorrhagic. Grew from outer lower portion. Unilocular cyst.
30	Powers.	M. 18			Both cases operated on by marsupialization.	Death on twelfth day, from sepsis due to absorption from cyst wall.	
31	Leonte. XIV Congrès. Chirurgie, Paris, 1901.	F. ..				Both recovered.	Both unilocular, sero-sanguineous cysts of spleen; capacity, 1400-2000 cubic centimetres.
32		F. ..					

BRIEF ANALYSIS OF THIRTY-TWO TABULATED CASES.

Etiology.—These thirty-two cases represent the known clinical material which has been under observation during life. In all but one (Michailowsky) the sex is given, viz., male 8, female 23. In twenty-one female cases the ages are given; and we learn that the very great majority (eighteen) occurred during the menstrual years; at least sixteen in the childbearing period. Making due allowance for the influence of injuries and diseases of the spleen, and for the fact that in some instances the cysts were a long time in developing, there seems no reason to doubt that these occur often enough in women during the reproductive cycle to give the affection a gynæcological bias. If we study the cases discovered in chance autopsies, the data, while scanty, do not appear to show this; so that we are perhaps justified in regarding menstruation and parturition as merely aggravating causes. In a few instances the cyst became much enlarged by childbirth, and perhaps full particulars of the history—which details are often wanting—would increase the number.

Aside from the teachings furnished by sex and age the meagreness of many case-histories renders further data as to causation of limited significance. Traumatism and antecedent disease of the spleen (specially malarial enlargement) undoubtedly act as contributory causes in not a few cases; in as many others, however, such factors are wanting. Whatever the original cause, we often find recorded an acute exacerbation which brings the patient under medical observation. Aside from childbirth, we know nothing of the causes of such exacerbations.

Symptoms.—After the cases came under medical observation, the cystic character of the tumor seems to have been generally recognized, although in a few cases the diagnosis—rightfully or wrongfully made—of an enlarged or floating spleen is recorded.

Diagnosis.—The precise diagnosis, both as to origin and character of the cyst, was seldom made, although in some cases

it was recorded as a possibility; that is, it was noted as one member of an alternative.

Treatment.—When we come to treatment, we find that of the thirty-two cases one died of intercurrent rupture of the stomach before operation could take place (Chavier). In two of Subbotic's cases the spleen was really removed for chronic hypertrophy, and the discovery of complicating cystic formations was simply accidental. Finally, in one of Leonte's cases (No. 21), not accessible at first hand, the reviewer (Heinricus) omits to state the result of the operation (splenectomy), although we have every reason to believe that it was successful. This leaves twenty-eight cases for consideration. Analyzing these, we find that the patients have been treated as follows: simple puncture, 3; incision and injection, 2; incision and drainage, 5; marsupialization, 3; extirpation of cyst, 5; extirpation of spleen, 10.

Puncture.—Of the three cases (4, 13, 22) of puncture (Marcano and Féréal, Baccelli, Reimann), in the first of which a retention-cannula was used, two patients made a relative recovery. In one a fistula remained, and in another complete resolution did not occur. The third was merely a case of palliative tapping, and no improvement resulted.

Incision (and Injection).—The two cases (1, 3) thus treated were among the earliest recorded (Pean). Both patients died of peritonitis; the first after a course of iodine injections, the second soon after incision, probably anticipating injection treatment.

Incision and Drainage.—(This method includes tamponade.) Of five cases (15, 18, 19, 24, 30) thus treated, three made complete recovery, and a fourth a relative recovery (persistence of small fistula). The fifth patient (author's case) died of sepsis.

Marsupialization.—Three cases (14, 31, 32) treated in this manner made good recoveries.

Resection of Cyst.—This operation was performed five times (Cases 2, 7, 8, 9, 10), and varied with the nature of the cyst. If a pedicle was present, the latter was readily tied

off, otherwise the extirpation was effected as thoroughly as practicable. It is worthy of note that all of these operations were done at an early date (none subsequent to 1892). Four patients made complete recovery. The fifth, Terrier's case, made a relative recovery, the spleen being slightly enlarged and tender a year after operation.

Splenectomy.—There were ten cases (5, 6, 11, 12, 16, 23, 25, 27, 28, 29) of this operation (we do not include two cases of splenectomy by Subbotic in which the operation was really done for chronic enlargement), and all recovered.

A comparison of these methods appears to show that puncture, incision, and drainage, and resection of the cyst proper, while able to secure permanent recovery in selected cases, are nevertheless untrustworthy, each having failed (in a part of a small series of cases) to produce cure, while several fatalities have resulted. Although marsupialization has a clean record in a small number of cases, it is manifestly restricted to those in which the integrity of the spleen is not compromised. On the other hand, splenectomy appears to be the only operation of general applicability, and to be a necessity whenever the spleen is extensively affected, either by pre-existing disease, or by displacement, or by atrophy due to the compression of large cysts, etc. We must bear in mind that the conservative operations are, as a rule, of relatively earlier date than the radical, and were employed largely in the thought that total ablation was fraught with great danger to the system at large. Those who first removed the spleen for this condition seem to have been very anxious as to the state of the blood count, thyroid, and bone-marrow.

Pathology and Nature.—Not very much is to be learned from an analysis of the clinical material as to the actual nature of these cysts, most of the speculation as to the origin and development of the formations being based upon autopsy cases in which the cysts are small and latent. As has been observed, it is a long distance from the latter findings to cysts of surgical importance; and it is difficult to show a direct transition from the one to the other. Indeed, they may represent two

entirely independent conditions. The autopsy cyst is of common occurrence; one pathologist may encounter many cases in a lifetime. The clinically important cyst, on the contrary, is very rare, and few surgeons encounter more than one or two in an entire experience.

Clinical observation, however, teaches us these truths,—nearly all of the cysts which come to treatment are large and unilocular, and of the serosanguineous type. They contain from one to ten litres of fresh or old blood, and the greater the age of the cyst the greater the secondary alterations resulting from absorption of the fluid portion, decomposition of coloring matter, and persistence of organized fibrin, cholesterin, mineral matter, etc. The walls of the cyst consist of a varying proportion of splenic and fibrous tissue with corresponding variations in the thickness.

Without going into speculation based upon histological studies of small cysts found accidentally at autopsy, it seems safe to say that the typical cyst of the spleen, from the purely surgical stand-point, originates in a subcapsular hæmorrhage of whatsoever origin. This is especially true of the cases reported during the last ten or twelve years. We find a consensus of data which shows that the slight, continuous escape of blood beneath the capsule—never severe enough to present symptoms of internal hæmorrhage—causes a hæmatoma; and that the peritoneal capsule undergoes a low form of inflammation which almost invariably results in adhesion to the outlying tissues. If the tumor is of sufficient size, pressure symptoms result which may affect the thorax or abdomen, according to locality. If the peritoneal reaction is sufficiently intense, pain, vomiting, etc., may come on. If the pressure is exerted upon the spleen itself, the organ undergoes atrophy in time.

But although this seems to be the predominant form of splenic cyst, and one which is very sharply characterized, it by no means represents all the possibilities of the lesion. There are other cases in which the hæmorrhage cannot be regarded as subcapsular, but must be thought parenchymatous. The former has a free field in burrowing between the spleen and its

capsule, in accumulating in large amounts, and in causing perisplenic adhesions and pressure symptoms. The latter is deeper seated, smaller, and more localized, originating probably from rupture of a splenic blood-vessel. Its walls are composed originally of normal splenic tissue, which in time becomes transformed in part into simple fibrous tissue. While it tends to come to the surface of the spleen, the pressure symptoms and the peritoneal adhesions are much less in evidence. The difference between the two types is essentially one of degree. The contents of these cysts are the same, and under certain circumstances the two may produce in time the same clinical picture. Generally speaking, however, the parenchymatous variety is more strictly isolated, and is localized in a particular region of the spleen, the remainder of the organ being intact. It has even happened that these cysts have formed pedicles or have developed sessile attachments to a spleen otherwise normal. Hence it is not surprising, bearing in mind the former fear of extirpating the entire spleen, that the earlier operators employed conservative measures in dealing with these cysts, especially when they were clearly circumscribed. Nor can we, even at this time, deny that such sharply localized cysts are best treated conservatively in selected cases, especially when the cyst is pedunculated.

Non-hæmorrhagic cysts are of such rare occurrence clinically that they may be left out of consideration.

Some of the more recent writers, in view of the frequent complication of perisplenitis, are calling attention to the diagnostic value of a perisplenic friction sound, which is synchronous with respiration. Such diagnostic evidence, while obtainable in certain cases, seems to the writer of doubtful value.

Heinricius states that the hæmatoma is readily distinguished from all other cysts as to origin and nature. It must be due either to rupture of a healthy vessel by trauma, or of a diseased vessel either spontaneous or traumatic. Probably as a result of the study of autopsy material, he adds that such ruptures may occur in connection with tumor formation (doubtless meaning angiomata). These blood cysts differ in

no wise from hæmatomata in other localities. Heinricius appears to have overlooked the fact that the typical hæmatoma is subperitoneal or subcapsular, with an almost inevitable tendency to cause adhesions; at least, he speaks of the process as though it were essentially intrasplenic.

In regard to the evolution and symptoms of large cysts, Heinricius states that they most often grow in the direction of least resistance, *i.e.*, downward and forward; yet he admits that in some cases the pressure is exerted towards the diaphragm. The relation of the growing cyst to the surrounding viscera and to local and general symptoms is not explained. Generally speaking, the tumor is of irregular contour, fluctuating in places, and rather insensitive. The rate of growth may be very variable. His statement that the cysts may rupture or suppurate does not seem to be borne out by facts.

Diagnosis must, as a rule, be made by exclusion alone. In addition to sources of confusion already cited, pleural effusion, cyst of the right lobe of the liver, and abscess of the abdominal wall may be added.

The patient's account of his own case possesses considerable value. Exploratory puncture can throw but little light on the origin of the tumor.

The operation almost invariably indicated is splenectomy, which is only contraindicated by extensive adhesions and extreme cachexia. Extirpation of the cyst is practicable only when a pedicle is present. Other interventions are condemned. They are essentially palliative and, moreover, dangerous.

Monnier explains the predominance of female patients in the reproductive cycle by the fact that the spleen becomes hyperæmic and relaxes during menstruation, pregnancy, and menopause. He thinks small latent cysts may become hæmorrhagic, but admits that no one has demonstrated a connecting link between them and the large hæmatomata. The blood count is of no value in diagnosis, since it undergoes no change. He is inclined to believe that the perisplenic friction sound has a limited diagnostic value, even if it only serves to exclude the possibility of extraperitoneal tumors.

PERFORATION OF THE GALL-BLADDER.

WITH A REPORT OF TEN CASES.

BY ARCHIBALD MACLAREN, M.D.,

OF ST. PAUL, MINN.,

Professor of Clinical Surgery in the University of Minnesota.

GALL-BLADDER perforations are comparatively rare, especially if we confine our observations to ruptures due to violence, ulceration, and gangrenous inflammations. But if we add to these the cases of cholecystitis in which inflammatory products have evidently escaped from or passed through the wall of an inflamed gall-bladder, even though we may not find the perforation itself, the number of cases is considerably increased.

When an abscess forms about an inflamed appendix, we speak of it as due to a perforation of the appendix. Such abscesses about the gall-bladder, either in the free peritoneal cavity or in the neighboring liver tissues, are rare as compared with appendiceal abscesses, but are not uncommon, and unquestionably should be included when studying perforations of the gall-bladder.

Fistulous passages between the gall-bladder and duodenum, stomach, or colon, are, of course, due to perforation of the gall-bladder, and usually to the ulceration through the visceral walls of a large gall-stone. Large-sized stones always pass in this way instead of through the ampulla. (Mayo.)

Most perforations of the gall-bladder occur in neglected cases where gall-stones have been known to exist for long periods of time, and where the patient has had ample warning through many attacks of biliary colic. In such a patient, a secondary cholecystitis or an attack of typhoid fever brings the added risk of perforation of the gall-bladder, producing either septic peritonitis or a localized abscess.

In the medical literature of to-day we find a few reports of single perforation cases, and Drs. Erdmann and Keen, in the *ANNALS OF SURGERY* some two years ago, collected thirty-four cases of primary typhoidal perforations. Of this number seven were operated upon, with four recoveries. Of the twenty-seven not operated upon, all died.

We may approximate the percentage of perforative cases by a careful study of Robson's 539 operations on the gall-bladder and bile ducts published in December, 1903. In the text he only speaks of five perforative cases; but if we carefully read the detailed histories of all of his reported cases, we will find that twenty-five of these cases can be fairly said to be perforative in character, or a percentage of .046 per cent. In his first 270 cases only seven are of this character, while in the last 270, eighteen, or .066 per cent. Of this number there are three cases of general peritonitis due to rupture of the gall-bladder; ten intraperitoneal abscesses, most of them containing gall-stones and usually situated between the gall-bladder and the duodenum; one in the head of the pancreas, containing a single gall-stone; several abscesses containing gall-stones; four fistulæ, three between the gall-bladder and the duodenum and one between the gall-bladder and colon. And there was one case where a gall-stone was found one-half in and one-half outside of the gall-bladder, still plugging the opening. Of these twenty-five cases there were five deaths, or a mortality of 25 per cent.

The Drs. W. J. and C. H. Mayo, in 328 cases operated upon between June, 1901, and February, 1902, at St. Mary's Hospital, found thirteen cases where gall-stones were lying in pockets outside of the gall-bladder. There were two subcutaneous abscesses containing gall-stones, and one case in which such abscess had ruptured, leaving a fistula discharging pus and gall-stones, a total of sixteen cases. Dr. A. J. Ochsner, in the forty-eight cases operated upon at the Augustine Hospital in 1901, had one perforation; fourteen gall-stones were found in an abscess in the anterior abdominal wall. Single perforative cases from gangrene of the

gall-bladder are reported by Hotchkiss, Mayo, Robson, and Gibbon.

Rupture of the gall-bladder from violence is rare, especially if in its normal state. Dr. John F. Thompson's and Dr. De Forest Willard's cases stand practically alone in this class. In the latter the child was crushed by a wagon-wheel, and two months later Dr. Willard found sixty-four ounces of encapsulated fluid which was almost all pure bile.

CASE I.—The first case of perforation of the gall-bladder that I ever saw was due to direct violence exerted upon an enlarged diseased gall-bladder. Major W. was a Civil War veteran, sixty years of age. He was supposed to have suffered from chronic malaria, for which trouble he was sent to Minnesota some twenty years ago. For many years he was a patient of Dr. William Pepper, of Philadelphia, and he had seen all of the leading medical men of the East on account of periodic enlargement of the "liver," which was never associated with marked colic or jaundice. I knew him as a friend and neighbor for many years, during at least ten years of his later life, when he was never seriously ill. As a result of a gunshot injury received in the service, he wore a wooden arm. Tripping, one day, on the street, he fell forward, with his arm bent under him so that the wooden fingers of the artificial arm pressed directly on his enlarged gall-bladder and caused it to rupture. I saw him forty-eight hours later in consultation, when an operation would have been of no avail. Later, I made a post-mortem examination and found a general septic peritonitis due to a perforation of a gall-bladder at least six inches in diameter, with very thick walls. The rent in the anterior wall of the gall-bladder would admit my finger. The gall-bladder contained over fifty large-sized old black stones and thirty-two ounces of thick pus; pus was also present in the peritoneal cavity.

CASE II.—Mrs. S., (?) aged 35 years; seen with Dr. Beal, of West St. Paul; never had suffered from typhoid or jaundice; colic every other night for past two weeks, with evidence of upper peritonitis of a subacute character.

Operation, November 30, 1899; universal adhesions; a small, thick gall-bladder containing six medium-sized gall-stones. A hard nodule in the under surface of the liver was opened and found to contain a single gall-stone of the same size, color, and shape of the other six. This cavity and the gall-bladder were drained, and the woman promptly recovered.

CASE III.—Dr. De W., aged fifty years, U. S. A. First attack of colic fourteen years ago. One year before I saw him, while serving in the army in Cuba, he broke down, and was invalided home with a return of his attacks of colic. He first became aware of the existence of a tumor in the gall-bladder for weeks before consulting me. Just as all preparations had been made for an operation, the tumor suddenly disappeared, and the patient felt better. Later, he commenced to suffer with night pains, pleuritic in character, in the gall-bladder region, and ten days later the operation was performed. A small abscess between the colon and the perforated gall-bladder was found. There were no gall-stones either in the biliary passages or in the abscess, but a perforation as large as a lead-pencil was found on the anterior wall of the thickened gall-bladder. The gall-bladder was drained; it should have been removed, for a mucous fistula still exists, and the colonel is perfectly comfortable while it discharges, but very uncomfortable when it attempts to close.

CASE IV.—Mrs. J., seen with Dr. Jones, of Battle Lake, Minnesota. Patient was thirty-five years of age; had been sick and suffering with right hypochondriac pains for three weeks past. Universal adhesions were found binding the thickened, inflamed gall-bladder to the pylorus, duodenum, and colon. One large-sized gall-stone was found wedged into the cystic duct; the gall-bladder was filled with a thick, muddy, serous fluid. Under the gall-bladder was a small puddle of the same thick fluid, although no perforation could be found. Mrs. J. promptly recovered after drainage of the gall-bladder, and was well when last heard from, eighteen months after the operation.

CASE V.—Mr. A. was almost a full-blooded Indian, living in the Indian Territory. Taken sick while travelling through the North-West. He had been sick for three weeks with a hard, pain-

ful tumor just below the edge of the ribs on the right side. He had a constant temperature of about 101° F. and was slightly jaundiced.

At operation he was found to be suffering from gangrene of the gall-bladder and quadrate lobe. Drainage of the abscess with a tube was unsatisfactory, and he refused to be operated upon the second time. This patient died from sepsis eight days after the operation. Postmortem by Dr. Cameron, no gall-stones, but extensive gangrene of the gall-bladder and neighboring liver tissue.

CASE VI.—Mrs. C., sent by Dr. Charles Germon, Balaton, Minnesota; sixty-one years of age; thirty years ago had suffered for three or four years with biliary colic, the attacks coming every few months and frequently lasting two or three hours. After this time she had no abdominal distress for twenty years.

Of late there had been a return of her old trouble, which was now more constant and more intense in character. She was jaundiced, with clay-colored stools, frequent chills, and irregular temperature. At the operation the small contracted gall-bladder was found densely adherent to everything, especially to the duodenum, which showed a well-marked scar of an old perforation. Three stones were found in the common duct. Cholecystectomy and choledochotomy were followed by recovery, and seven months later she reports herself cured.

CASE VII.—Mr. B., aged twenty-five years; patient of Dr. Ramsey, of St. Paul. Last September I operated upon this young man for relapsing appendicitis during the interval, and removed a seven-inch appendix showing subacute inflammatory changes. Three days after the operation he developed a right lobar pneumonia, which resolved on the eighth day. He was perfectly well for two months, when he had an attack of cholecystitis; soon after he had an attack of obstruction, with marked impaction in the transverse colon, relieved on the tenth day. From this he quickly recovered and was well enough to be married. About two months after his marriage he had a second attack of cholecystitis, with persistent vomiting of bile. All nourishment was stopped by mouth, but still his vomiting continued; three or four times each day he vomited about six ounces of a deeply green fluid. Operation was postponed because of his good general appearance and pulse, which ranged about 80.

ARCHIBALD MACLAREN.

After he had been nourished and watered through the rectum for a month and was not able to retain even water, I operated upon him, and found a contracted gall-bladder adherent to all of the surrounding tissue, but no stones. A broad band of adhesions ran from the gall-bladder region down across both the duodenum and the transverse colon, markedly constricting them both. This was divided, and the gall-bladder was then removed. In removing the gall-bladder, I opened into an abscess of the liver, which contained three ounces of thick brownish pus just at the commencement of the cystic duct. Thinking that I had found the cause of all his trouble, I did not open the common duct, but stitched a tube into the stump of the cystic duct and drained the abscess cavity. He showed no bad effects from the operation; but his vomiting continued just the same, and, no bile being discharged from the drain, eight days later through a new opening I made a gastro-enterostomy by Mayo's latest method, when the patient immediately stopped vomiting, and is now perfectly well, having gained forty pounds in two months.

CASE VIII.—Mr. C., aged forty-five years; farmer; seen with Dr. H. Rees, of Maynard, Minnesota, at his own home, November 20, 1904. Patient had suffered from several distinct attacks of biliary colic, usually lasting for two to three hours. The last attack commenced two weeks ago and still continues. He has been very sick ever since, with a temperature ranging from 100° to 102° F., with frequent chills, slight jaundice, constant pain and tenderness, with some induration in the gall-bladder region. Operation in the farmhouse; opened an abscess which extended from the edge of the liver to the line of the umbilicus and contained a quart of bile-stained pus. The gall-bladder filled with stones could be felt in the upper wall of the abscess cavity; no attempt was made to demonstrate the perforation or to attempt to remove the stones at this time. The abscess was drained for four weeks, and the man slowly regained some flesh and strength; but he never felt well, and suffered some pain in the region of the liver, which was supposed to be due to gall-stones. On April 3, I operated upon him again at St. Luke's Hospital, St. Paul. I found a universally adherent, small, contracted gall-bladder containing thirty gall-stones and no bile. In attempting to explore the ducts, I found that the liver was

unusually fixed. In separating adhesions between the upper surface of the liver and the diaphragm, I unexpectedly put my finger into a large subdiaphragmatic abscess; without withdrawing the finger, I cut down upon and resected two inches of the seventh rib in the anterior axillary line, opened the free pleural cavity and tamponed the opening all around with a thick veil of iodoform gauze until all breathing sounds were stopped, then opened the abscess through the diaphragm and let out fully eight ounces of thick offensive pus; a counter-opening was made in the back and thorough drainage made with a rubber tube. This man made a slow recovery; seven days after the operation he discharged two gall-stones from the abscess. He left the hospital six weeks after his operation with his sinuses almost closed and steadily gaining in flesh.

CASE IX.—Mrs. C.; seen with Dr. Merrill, of Stillwater, Minnesota; aged thirty-two years; one child three weeks old; she had suffered a great deal of pain in the gall-bladder region during the last weeks of pregnancy. Jaundice and tumor appeared ten days ago. Exploration demonstrated an abscess adherent to the anterior wall containing fully six ounces of thick pus and six gall-stones. She left the hospital two weeks after the operation; the discharge continued for a few days, but was entirely stopped at the end of three weeks. There never has been any discharge of bile.

CASE X.—Miss C., aged thirty-two years; suffered from her first attack of colic in the fall of 1899. In December she developed typhoid; commenced having pain in the gall-bladder region during the fifth week. She steadily grew worse, and was taken to Rochester, where she was operated upon by Dr. W. Mayo, January 22, 1900. A large abscess was opened in the gall-bladder region, which in the next few days discharged five large and twenty small gall-stones. She left the hospital in about one month and remained well for about four years, when she suffered from a sharp attack of biliary colic.

One year later she had a second attack, which was more intense in character and lasted three days. About a month after this attack, February 17, 1905, I operated upon her, separated extensive adhesions to the gall-bladder and liver, and removed five old black stones from the gall-bladder and drained it. Bile

commenced flowing on the third day, and she soon recovered, and is now apparently quite well.

I have operated upon eighty gall-stones cases, nine of which were perforative in character, and one postmortem, making a total of ten, which seems to be a large proportion as compared with other lists of cases already on record. There were eight recoveries and one death. In this fatal case I believe that the result would have been the same even though the gall-bladder had been removed, because, with gangrene of the gall-bladder and the neighboring tissues, and especially in the presence of a localized abscess, any operative work which disturbed the abscess wall would only have spread the infection and lessened the chance of recovery. I believe that in any perforative case which has gone on to the formation of a localized abscess, the wisest course is to open and drain the abscess, waiting until a later time to deal with the gall-stones or the disease of the gall-bladder.

In perforative cases where the infection is not localized, then cholecystectomy with local, if necessary, drainage of the kidney pouch and the pelvic cavity with the Fowler position gives the patient the best chance of escape.

If these cases prove anything, it is that gall-stones should always be removed as soon as the diagnosis can be made, and in the interval, before complications have arisen to increase the danger and lessen the certainty of a perfect recovery.

THE VALUE AND PLACE OF DUODENOCHOLEDOCHOTOMY IN GALL-STONE SURGERY.

BY JOHN C. HANCOCK, M.D.,

OF DUBUQUE, IOWA,

Surgeon to Finley and St. Joseph's Mercy Hospitals.

DUODENOCHOLEDOCHOTOMY was devised to accomplish the removal of offending gall-stones in that part of the common duct included within, or adjacent to, the walls of the duodenum, more particularly to remove stones impacted in the diverticulum of Vater. In this class of cases and in neoplasm of the papilla and, more recently, in removal of pancreatic calculi this operation has a distinct place and meets the requirements satisfactorily.

McBurney¹ in 1891 devised and first performed this operation for a stone in the duodenal part of the common duct with recovery of stone and patient. In 1894, without knowledge on his part of McBurney's procedure, Kocher² employed the same route. Kehr,³ independently of Kocher, performed the operation in 1894. Pozzi⁴ in 1894 likewise performed the operation successfully. Robson⁵ in 1897 did the operation probably for the first time in England. Up to the end of 1899, according to Kocher, the route had been employed twenty times with two deaths. To this number Thienhaus,⁶ by collecting 8 cases and contributing his own, added 9. Besides these Robson⁷ has reported 13 of his own cases and 1 of Dalziel.⁸ Of these some and the one of Moynihan⁹ were for pancreatic calculi, alone or with gall-stones. McBurney has done this operation in 11 cases, of which 9 are through his kindness reported for the first time by the author. W. J. Mayo has employed the operation 6 times, 4 times for stone and twice for neoplasm of the papilla. Of these 4 are herewith reported for the first time through his courtesy and 1 only is included in the statistics of Thienhaus. Kehr¹⁰ more recently reports 3 cases, and to these enumerated the author adds another. From this it will appear that without duplication so far as

known 33 cases are herewith added to the 29 cases already reported, making a total of 62 cases. Twenty of these, or approximately one-third, were collected by Kocher¹¹ for the period 1891 to 1900. Since then 41, or more than twice as many, have been done in the last five years, showing that the operation has found its place among established procedures. In view of the impetus of recent advances in pancreatic work the operation will doubtless acquire increased importance and usefulness.

Pantaloni¹² discriminates between lithotomia transduodenalis and choledochotomia transduodenalis. The former devised and performed by McBurney consists in approaching the stone in the common duct near the papilla through an incision in the anterior wall of the duodenum and removing the stone by incising the papilla. Collins modified the last step by dilating the papilla and removing the stone. Kocher's¹³ operation of choledochotomia transduodenalis consists in immobilizing the stone in the duct between the fingers and after opening the duodenum, cutting directly down upon the stone through the duodeno-duct wall.

The scope of these procedures was originally confined to the removal of offending gall-stones from the lower end of the common duct, and of the series of 62 cases this was the purpose in 57 or approximately 92 per cent. Later it was made to extend to the relief of obstruction from neoplasm of the papilla. This was done in two cases or 3 per cent. More recently removal of pancreatic calculi by this route has been reported. Thus of the five cases of operation for pancreatic calculi collected by Robson and Clarke from the literature and reported by Robson¹⁴ three at least were modified duodenocholedochotomies. Of the indications for the operation the obvious is obstruction from a gall-stone impacted in the diverticulum of Vater, neoplasm or stricture of the papilla, and pancreatic calculi in the diverticulum or at, and adjacent to, the orifice of the ducts of Wirsung and Santorini. Indications of convenience, rather than urgency are obstruction from a stone not actually in the

lowest part of the duct but more accessible via the duodenum than from without by virtue of adhesions; and occasions according to Robson,¹⁵ "when the liver is small and the common duct cannot be made to reach the surface, its exposure through the duodenum may be simpler than the ordinary operation of choledochotomy." Zeller¹⁶ cites an interesting case in which he failed at operation to detect a stone in the lower end of the common duct by palpation and found it at autopsy by passing a probe through the papilla. Since then he has practised sounding the end of the duct through the duodenum when the stone is not readily palpated and thinks the danger of infection is greatly overrated. W. J. Mayo¹⁷ regards the operation as incomplete without a supra-duodenal-choledochotomy on the ground that the obstructing stone removed via the duodenum "may not be the largest present, and others may still remain in the duct;" therefore he recommends "the common duct should at the same time be opened, explored, and drained." That this step is necessary or even desirable in all cases does not appear from the records of reported cases in which it was not done. Drainage, of course, in such cases which represent the cumulative effects of chronic obstruction is important for the success of the work, and where the usually small and contracted gall bladder is not available for drainage purposes a supra-duodenal opening into the common duct may be desirable. In the author's case, which is not cited here to prove that drainage is not necessary in most cases, the gall-bladder was removed after tying the cystic duct and no provision was made for drainage beyond that of a dilated common duct orifice which passed bile freely as soon as the obstructing stone was removed. Moreover in regard to the size of the stone would it not usually be possible to recognize a larger stone in a location more favorable for recognition than a smaller one which had been recognized in a less favorable locality? A stone too large to be removed safely via the duodenal route should be removed by the supraduodenal way. Furthermore, duodencholedochotomy as indicated above is preferred to supra-duodenal-choledochotomy in certain fixed

positions of the common duct as from adhesions or a small liver. In suitable cases supplemental supra-duodenal-choledochotomy ensures added thoroughness and effectiveness, especially when the procedure of drawing gauze strips through the duct between the upper incision in the duct and papillary orifice, as practised by Mayo and Kehr, is carried out.

In regard to the special technique incident to duodeno-choledochotomy McBurney¹⁸ lays stress on the following procedure: "In all cases which are not complicated by very deep adhesions involving the common duct and descending portion of the duodenum, it is easy and very desirable after determining the presence of a calculus in the lower part of the duct to pass the left forefinger through the foramen of Winslow to a point behind the calculus. With the finger the lower end of the common duct, the calculus, and the descending portion of the duodenum can be lifted forward so as to bring these parts nearly or quite to the level of the abdominal incision. The duodenum is then incised in its anterior wall for from one inch to one inch and a half, the orifice of the duct (which is usually markedly altered as to the color, etc.) is easily found and enlarged with knife or scissors or forceps, and the stone removed; all of this, and even the suture of the intestinal wound, should be completed without removing for a moment the left forefinger from its supporting position."

In choledochotomia-transduodenalis Kocher¹⁹ advocates suture of the incision in the posterior duodenal wall when one can be sure that the opening of the papilla will not thereby be narrowed. Robson,²⁰ on the other hand, has found no need as a rule to suture the posterior duodenal wall. As pointed out by Kocher, however, this is only admissible when the incision has been strictly within the wall of the duodenum and does not extend upward, so as to allow the escape of infected bile into the space between the duct and duodenum. The higher the incision, therefore, the greater the need of suture.

The objections to the operation are based on technical difficulties and postoperative danger. The difficulty in finding the papilla is overestimated and is apparently based on dis-

secting room studies where the absence of pathological guides is probably responsible for erroneous conclusions. In operating in the presence of pathological conditions we have as aids pointing to the position of the papilla first the calculus supported on the left forefinger and second with the duodenum opened the thickening and discolored appearance of the papilla. Those who have actually done the operation regard this difficulty rather fancied than real. The other principal technical difficulty is the depth of the wound. With the means of bringing the parts into the wound described above and aided by Robson's²¹ sand-bag under the lower dorsal spaces this objection is largely removed, and certainly does not apply to duodenocholedochotomy any more than to supra- or retro-duodenocholedocotomy.

Postoperative dangers are said to be twofold: (1) duodenal fistula threatening starvation, and (2) infection leading to a fatal result. Of the 62 cases on whom the method has been used two have developed fistulæ. Of these, both Robson's²² cases, one case, No. 288, died three weeks after operation from exhaustion due to difficulty in feeding on account of the duodenal fistula. The other case, No. 431,²³ developed some leakage from the duodenum which ceased after a time. In regard to infection much light has been thrown upon the subject by the vast amount of work done in the upper abdomen. In view of the freedom with which the duodenum, upper bowel, and stomach have been opened, it is clear this danger is not greatly to be apprehended, provided care is used in the work. In surgery of the bile tract, especially common duct stone and more particularly the late stage with stone impacted in the diverticulum of Vater, it is the effect of obstruction and infection on the liver rather than peritonitis that causes death, as brought out by W. J. Mayo.²⁴

The mortality of the cases operated on by the method under discussion is briefly as follows: viz., 62 cases of all sorts with 8 deaths give a mortality of 12.6 per cent. Deducting from the number of cases the three pancreatic cases of Robson and the two neoplasm cases of Mayo and subtracting the 3

deaths in these five cases, we have respectively 57 cases and 5 deaths or 8.77 per cent. for the mortality of duodenocholedochotomy in the gall-stone cases. Until comparatively recently, Robson's²⁵ mortality for choledochotomy was 16.2 per cent., but more recently has been lowered to 5 per cent. Kehr²⁶ has a mortality of 6.5 per cent. and the Mayo's,²⁷ 11 plus per cent. It thus appears that the average of early and late duodenocholedochotomies gives a mortality per cent. comparable with the more recent statistics of supra-duodenal-choledochotomy.

In order to determine whether or not there were operative any factors peculiar to duodenocholedochotomy in the 5 deaths in the stone cases, it will be necessary to go behind the returns and ascertain briefly the causes of death. One of McBurney's cases died on the third day after operation, in spite of all efforts to check it, of persistent hæmorrhage from minute vessels associated with deep and long-continued jaundice. The second died of uncontrollable vomiting on the fourth day and at a secondary operation no abnormality or cause of death was demonstrable. These accidents are features of the conditions present at operation regardless of the special form of procedure and therefore are not rightly chargeable to duodenocholedochotomy. Besides the death mentioned above, in which a fistula was conspicuous, Robson²⁸ has had a death-case, No. 243, following the operation due to a subdiaphragmatic abscess overlooked at both operations. Nothing in connection with the operative field was found post-mortem to be abnormal. Another case died of heart failure from presence of acute dilatation of the stomach, nothing else being found to account for the death. It appears from the records, then, that one death with fistula and one case with temporary fistula may fairly be cited, to the discredit of the operation. In view of this it hardly can be said that duodenocholedochotomy is extra hazardous. It has participated *pari passu* in the benefits of accumulated experience and improved technique which have accrued to this field from the vast amount of work done in the last few years. A point worthy of consideration, too, in comparing supra- and

transduodenal mortality, is that other things being equal a stone impacted in the diverticulum or papilla of Vater represents on the average a later period in the disease process, and hence greater danger from local injuries to the parts and systemic effects of chronic jaundice and infection.

The other operations calculated to accomplish the purpose of duodenocholedochotomy are the usual supraduodenal operation and retroduodenal choledochotomy. The former fails to be effective in just the class of cases for which the transduodenal operation was primarily intended, and offers, besides, no real diminution of risk. It is advantageous in some cases to perform both where stones are distributed along the common duct and finish by drawing gauze strips from the upper opening through the duct to sweep it clean. As a substitute for the transduodenal route the operation of retroduodenal-choledochotomy has been proposed and performed. Berg,²⁹ basing his views on dissecting-room work, has found with Brewer³⁰ under like conditions difficulty in finding the papilla.

The fallacy of drawing conclusions from comparisons between anatomical and pathological conditions has already been mentioned. Berg also claims the initial though slight danger of immediate peritoneal infection and that of a subsequent duodenal fistula as objections to the transduodenal route. Quervain³¹ gives a summary of the work done along this line and reports a case. The first step in this procedure was taken by Lane³² when he freed the upper part of the duodenum behind for purposes of investigation, but removed the stone by supra-duodenal-choledochotomy. Later, Kocher³³ endeavored to displace the duodenum to one side to reach the posterior wall, but on account of hæmorrhage from the pancreas changed to the transduodenal route. Jeantry³⁴ reports three cases performed by Monprofit. Some few others have performed operations which seem to have been along this line. After describing his own case, he sums up the situation by saying that the retroduodenal route is indicated in cases in which the duodenum may be freed in a clear, trim (Sauber) way. Where the duodenum, common duct, and pancreas are

matted together by adhesions, and one runs the risk, in separating the same, of injuring the walls of the gut, or starting hæmorrhage, in spite of care, one would do better to proceed by the transduodenal route. From a study of the anatomy of the pancreas and its relations to the duodenum and common duct especially as brought out by Robson³⁵ it would seem clear that this route would frequently on anatomical grounds alone not be available. Furthermore, the difficulty and time involved at the start in freeing the duodenum behind while working, as one must, at the bottom of a deep cavity will hardly appeal to one as advantages compared to the freedom and speed of the transduodenal route with the parts elevated well into the field of operation. Furthermore, additional time will be consumed in any attempt to replace the duodenum in its original position after extraction of the stone. Finally, there is a condition, an instance of which has recently come under the notice of the author, in which neither of these procedures would have been adequate, while Kocher's trans-duodenal-choledochotomy would have answered very well. I refer to a case with a stone the size of an olive low down in the common duct, a gall-bladder the size of a hazel-nut, absolute stenosis of papillary orifice, and a history of jaundice of fifteen months' standing with numerous ague-like attacks of fever, etc. The patient died from capillary and venous hæmorrhage from broken up adhesions and in spite of calcium chloride, etc. Post-mortem, it was clear that (1) retro-duodenal-choledochotomy would have been impracticable from the comprehensive manner in which the head of the pancreas embraced the junction of the common duct with the duodenum; (2) supra-duodenal-choledocotomy would have been but a preliminary step to a secondary choledochoduodenostomy, and (3) Kocher's trans-duodenal-choledochotomy with subsequent anastomoses using the same incision in duct and gut would have accomplished the choledochoduodenostomy in the easiest and quickest way.

A brief account of the author's case is as follows:

E. M. B., female, forty-six years old, had a primary chole-

cystotomy at my hands, January 10, 1903, whereby seventy-odd stones were removed. The fistula closed in five (5) weeks with an uninterrupted recovery except for slight return of nausea and vomiting, and colicky pains on the eleventh (11) and twenty-third (23) days respectively after operation. April 3, 1903, I was called to see the patient again and found her suffering with a severe attack of biliary colic. This time there was a slight but distinct trace of jaundice. Patient was removed to the hospital and operated on the same day. On opening the abdomen, it was interesting to notice the absence of adhesions except for one small band connecting the fundus of the gall-bladder with the peritoneum of the abdominal wall where it had been sewed at the first operation. Examination showed one small stone in the gall-bladder and another stone in the common duct where the latter passes through the duodenal wall. Several endeavors to pass the stone into the duodenum or up into the free part of the common duct were unsuccessful, although the stone was susceptible of slight movement, ball-valve stone of Fenger. It became clear the simplest and quickest way for removal was by the duodenum. Securing the stone firmly in the fingers of the left hand, and thus establishing a fixed point, the wall of the duodenum was incised on its antero-external aspect. The papilla was easily dilated and the stone removed. I then sounded carefully from below and found no more stones in the common or hepatic ducts, and closed the duodenum after satisfying myself that there was a free flow of bile at the outlet of the common duct. I suspected the gall-bladder of having contributed the offending stone, and having more in the cystic duct besides the one readily felt at the fundus. I concluded, in view of its contracted and thickened walls and the stones to remove it. Tying the cystic duct where it joins the hepatic, I dissected the mass from the liver. The slight hæmorrhage was controlled by gauze packing, while gauze drains were placed to the wound in the duodenum and stump of the cystic duct. After four days of rectal feeding oral feeding was begun. The dressing was done the fourth day for the first time, and the wound healed kindly and closed the thirty-fourth (34) day. On the thirtieth (30) day after operation the patient menstruated, and during the menstrual period suffered with vertigo, headache, nausea, and vomiting. The vomitus contained bile, showing the

duct to be patent. Now, more than two (2) years later, patient reports herself as well and free from symptoms. On examination the bladder and cystic were found to contain many small stones, those in the duct being so distributed in folds and pockets as to obliterate the lumen of the duct.

Summing up the points for and against the transduodenal route it will be convenient to consider the question of neoplasm of the papilla and pancreatic calculi as well as gall-stone for the reason that a fine discrimination in diagnosis is often impossible in this class of cases.

(1) In favor of duodenocholedochotomy for gall-stones in the lower end of the common duct are (*a*) the avoidance of drainage in some cases where one would not otherwise wish to sew up the wound in the duct and close the abdomen; (*b*) the greater ease in sewing the duodenal than the duct incision by virtue of size and proximity of the former; (*c*) uniformly kindly healing of intestinal wounds; (*d*) easy and natural access to common duct; (*e*) ease and benefit of dilatation of papillary orifice in ensuring better drainage of bile and detritus; (*f*) duct may be safely incised for half an inch in extracting stone or in enlarging the orifice for drainage. Against the procedure has been raised the common prejudice against opening gut in general, the fear of fistula which occurred in but two out of sixty-two cases, and the dread of infection which, as indicated above, has been vastly overrated in regard to the upper half of the intestines.

(2) In neoplasm of the papilla this route is clearly indicated for diagnosis and treatment where the growth is amenable to local treatment and the gall-bladder cannot be used for anastomosis or drainage.

(3) In total stenosis of the papillary orifice, whether from neoplasm or trauma of stones, a choledochoduodenostomy could be done with the incision employed in duodenocholedochotomy, where the anastomosis could be made low down in the common duct.

(4) In pancreatic stone, duodeno-pancreo-lithotomy is an

established procedure and for good anatomical reason is the method of election.

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CONSTRICTION OF THE DUODENUM BELOW THE ENTRANCE OF THE COMMON DUCT AND ITS RELATION TO DISEASE.¹

BY ALBERT J. OCHSNER, M.D.,

OF CHICAGO,

Surgeon-in-Chief of Augustana and St. Mary's Hospitals.

SEVERAL years ago my attention was first directed to an interesting condition which is frequently present in patients which come under my observation during gall-bladder and stomach operations.

In many of these cases the duodenum is distended with gas to a point just below the entrance of the common duct,

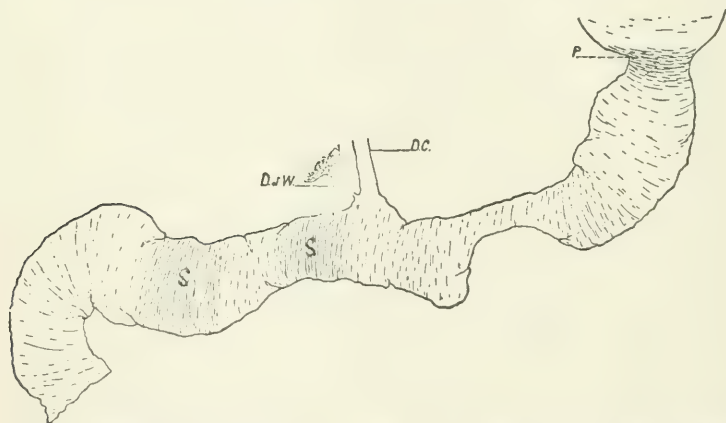


FIG. 1.—P, pylorus; D.C., common duct; D. of W., duct of Wirsung; S, a double sphincter.

while below this it is contracted, and upon raising the transverse colon and finding the origin of the jejunum, this portion of the intestine will also be found in a contracted condition.

In looking over authorities upon the subject of anatomy, I found that they all state that the third portion of the duodenum is the narrowest part of this intestine if they make any statement upon the subject. They also state that the first portion of the duodenum is usually found stained with bile after death.

¹ Read before the American Surgical Association, July, 1905.

Several further clinical observations pointed in the same direction.

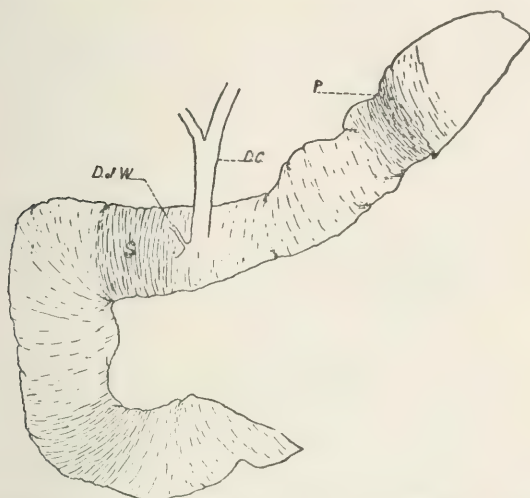


FIG. 2.—*P*, pylorus; *D.C.*, common duct; *D. of W.*, duct of Wirsung; *S*, sphincter below common duct.

It was found that the dilatation of the upper portion of the duodenum was most commonly present in patients suffering from chronic cholecystitis with sand or gall-stones in the

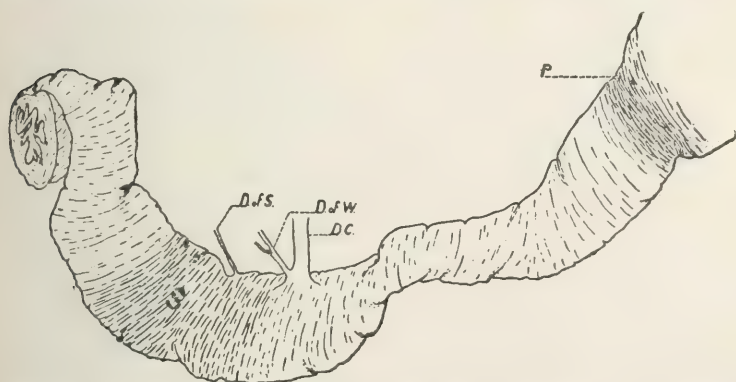


FIG. 3.—*P*, pylorus; *D.C.*, common duct; *D. of W.*, duct of Wirsung; *D. of S.*, duct of Santorini; *S*, sphincter below entrance of common duct.

gall-bladder. In these cases there was frequently a more or less marked enlargement of the pancreas.

In having the vomitus examined systematically for a con-

siderable period of time in patients who had been subjected to general anæsthesia for operation, it was found that the vomitus invariably contained bile, showing that there must be some reason why this fluid should be forced upward past the pyloric sphincter rather than downward through the small intestine.

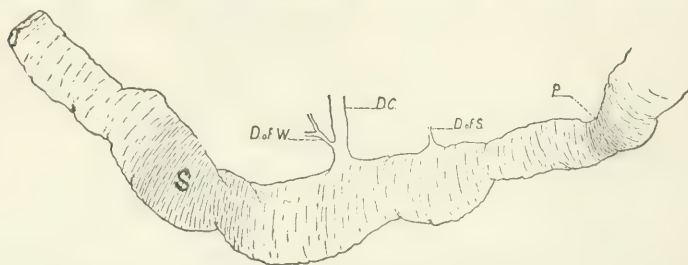


FIG. 4.—*P*, pylorus; *D.C.*, common duct; *D. of W.*, duct of Wirsung; *D. of S.*, duct of Santorini; *S*, sphincter below entrance of common duct.

Again, it was found that in patients suffering from acute gall-stone colic, the spasmodic pain would subside invariably within a few hours upon making careful gastric lavage and prohibiting the introduction of any kind of food into the stom-



FIG. 5.—*P*, pylorus; *D.C.*, common duct; *D. of W.*, duct of Wirsung, $2\frac{1}{2}$ centimetres from *C.D.* towards *P.*; *S*, point of greatest development of circular muscle fibres 10 centimetres below the entrance of the common duct.

ach, although without this aid large doses of morphine, given hypodermically, had given at best only temporary relief in these cases.

This seemed to indicate that there must be some point near the entrance of the common duct into the duodenum which regulates the passage of food through this intestine.

Since making these observations, the beautiful experiments of Dr. Cannon, and more recently those of Cannon and Blake (*ANNALS OF SURGERY*, May, 1905) have added another

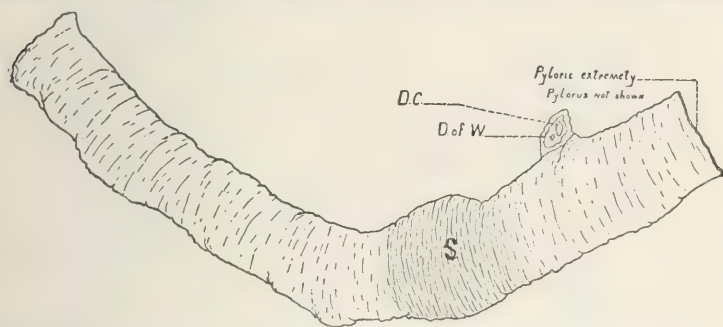


FIG. 6.—*D.C.*, common duct; *D. of W.*, duct of Wirsung; *S*, sphincter below entrance of common duct.

fact in the same direction by demonstrating that there is a distinct mixing process which takes place in the upper portion of the duodenum.

These clinical observations have induced me to make a

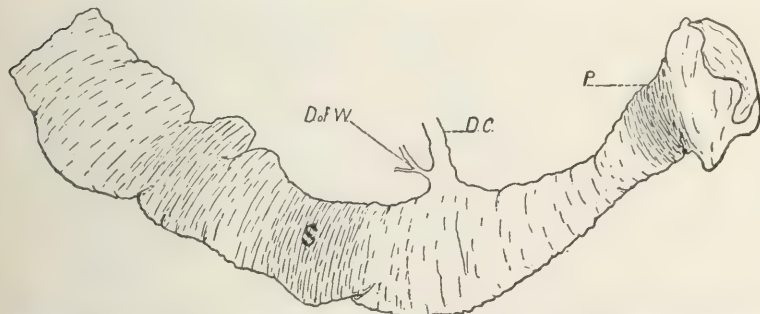


FIG. 7.—*P*, pylorus; *D.C.*, common duct; *D. of W.*, duct of Wirsung; *S*, point of greatest development of circular muscle fibres.

careful anatomical study of this portion of the small intestine, both in the living patient and in the cadaver.

My assistant, Mr. E. W. Thuerer, has dissected ten specimens, and has made accurate full-size tracings of the duodenum in each of these cases. He has further confirmed our observation by inspecting the duodenum in all cadavers dissected in the Medical Department of the University of Illinois during the past winter.

These specimens show a marked uniformity in several directions, as will be seen at once from the drawings.



FIG. 8.—*D.C.*, common duct; *D. of W.*, duct of Wirsung; *S*, point of greatest development of circular muscle fibres.

In all of these specimens there is a greater or less degree of narrowing between the pylorus and the entrance of the common duct; this can also be seen perfectly in the speci-

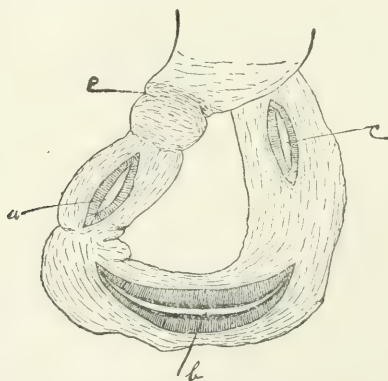


FIG. 9.—*P*, pylorus. The longitudinal incisions *a*, *b*, and *c* show the relative thickness of the circular muscle fibres, (*a*) between the pylorus and the point of entrance of the common duct, (*b*) at the point of greatest thickness 4 centimetres below the common duct, and (*c*) at the point of the duodenum 15 centimetres below this point.

mens at the present time, although their immersion in preserving fluid has, of course, brought about some changes.

In all of these specimens there is also a more or less marked thickening of the intestinal wall at a point 2 to 4 centimetres below the entrance of the common duct, and a careful study of this thickening demonstrates the presence of a marked increase in the circular muscle fibres, as is shown by

the accompanying microscopic sections taken from various portions of the intestinal wall as compared with this portion of the wall.

The arrangement of these circular muscle fibres would remind one very forcibly of the arrangement in the pylorus, although the fibres are much more diffuse, making a broad sphincter.

It seems as though all of these facts pointed towards the presence of a sphincter at this point whose physiological function would consist in providing for a means of retaining the

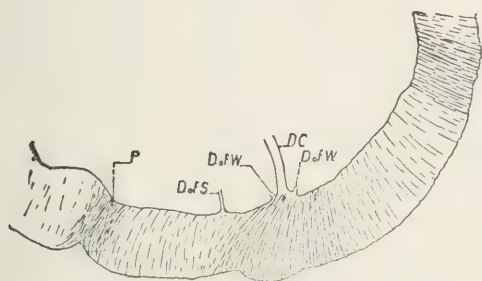


FIG. 10.—*P*, pylorus; *D. of S.*, duct of Santorini; *D. of W.*, duct of Wirsung, double in this case. The circular muscle fibres arranged obliquely, there being a sphincter-like arrangement directly opposite the entrance of the common duct.

chyme in the upper portion of the duodenum sufficiently long to provide for a thorough mixing with bile and pancreatic fluid, just as the pylorus serves the purpose of retaining the stomach contents, and the ileocæcal valve of retaining the contents of the small intestines.

We have long known that under certain pathological conditions the obstruction offered by the pylorus is increased far beyond the normal.

We also know that the passage of intestinal contents and gas is obstructed to a marked extent as the ileocæcal valve in case of inflammation in this vicinity, which is, of course, usually due to appendicitis; and it has seemed to me as though the above facts would indicate that under certain forms of irritation or inflammation of the gall-bladder or ducts, this duodenal sphincter had taken up a similar action, which would have to be considered physiological in character.

No.	Hosp. No.	Sex and Age.	Occupation and Nativity.	Past History and Family.	Condition.	Character.	Complications.	Examination.	Condition at Operation.
1	15342	F. 39	House-keeping, U. S.	Unimportant.	Gastro-enterostomy, cholecystostomy, gastric ulcer, cholecystitis.	Epigastric pain, vomiting; hæmatemesis six years.	Appendicitis 2 years ago, appendectomy 2 years ago; relief for 1 year and then recurrence of symptoms.	Epigastric tenderness; gastric ulcer, stomach not dilated.	Posterior surface near pylorus, gaping pylorus, duodenum enlarged; gall-bladder enlarged, sacculated, and contained dark, sandy bile; no stones.
2	15346	F. 40	Housewife, U. S.	Unimportant.	Gastric ulcer, chronic appendicitis, gastro-enterostomy, appendectomy.	Epigastric pain and gastric distress; seldom vomiting blood.	None.	Epigastric tenderness; stomach dilated, emaciated and anæmic.	Scar of old ulcer on anterior surface of pylorus; lymph glands enlarged; pylorus open $6\frac{1}{2}$ centimetres; appendix walls thickened; gall-bladder and pancreas normal.
3	15598	M. 49	Farmer, Sweden.	Liver trouble, cholecystitis.	Gastric ulcer, cholecystitis, gastro-enterostomy, cholecystostomy.	Right, hypochondriac pain and constipation 10 years; vomiting first three months; no blood; colicky pain in inguinal region.	Neurosis.	Tenderness beneath right costal margin and in right inguinal region.	Scar on posterior surface of pylorus, which is contracted and on jejunum; gall-bladder sacculated, distended with dark, sandy bile; appendix normal.
4	15635	F. 34	Housewife, Sweden.	Neurotic.	Ulcer duodenum, gastritis, lacerated perineum, gastro-enterostomy.	Vomiting and headaches.	Neurosis with enteroptosis.	Thin, anæmic; no marked abdominal tenderness.	Stomach and duodenum dilated; lymphatics enlarged; appendix and gall-bladder normal.
5	14254	F. 29	..... U. S.	Unimportant.	Cholecystitis, pancreatitis, gastritis, appendicitis, cholecystostomy, appendectomy.	Gastric distress after eating; intermittent attacks of vomiting; no hæmatemesis.	None.	Epigastric tenderness; emaciation and anæmic; anorexia.	Duodenum as large as stomach as far as common duct, where it is adherent to enlarged pancreas and constricted; appendix cicatricial; duodenum adherent to liver.
6	14427	F. 24	..... Denmark.	Unimportant.	Gall-stones, chronic appendicitis, cholecystostomy, appendectomy.	Epigastric, right hypochondriac and right inguinal pains; nausea, vomiting, jaundice; no hæmatemesis.	None.	Tenderness beneath right costal arch; poorly nourished and anæmic.	Duodenum enlarged, ducts free; cystic duct dilated; gall-bladder contains stone, black, sandy bile, numerous stones, and shreds of tissues.

7	14580	F. 48	House- wife, Sweden.	Typhoid at 21 years. ?	Cholecystitis, gastritis, appendicitis, cholecystostomy, appendectomy.	Apparitis attack 6 years; for 2 years epi- gastric pains, radiat- ing to right side and back; vomiting.	None.	Tenderness over Mc- Burney's point be- neath the right costal margin and over the middle epigastrium; fairly well nourished, but anæmic.	Stomach and duodenum down to point opposite papilla di- lated; omentum adherent; thickened gall-bladder, which contained dark bile.
8	14603	F. 53	House- wife, U. S.	Recurrent attack of gastritis. One sister died, ulcer- ated stomach.	Gall-stones, gastritis, pancreatitis, appendectomy, cholecystostomy.	Epigastric pain after eating lasts an hour; never vomits.	None.	Tenderness marked over Robson point; poorly nourished and anæmic.	Stomach and duodenum down to point opposite papilla di- lated; pancreas enlarged; com- mon and cystic ducts contain stones; chronic appendicitis.
9	14638	F. 51	House- wife, Sweden.	Typhoid at 18 years. 2 brothers died of gas- tric trouble; cancer.	Cholecystitis, pancreatitis, cholecystostomy.	Hypochondriac pain; seldom vomiting; ten- derness.	Epilepsy.	Tenderness in both up- per abdominal quad- rants.	Duodenum dilated down to papilla; pancreas enlarged and hard; gall-bladder en- larged, walls thickened, con- tains tarry bile.
10	14666	F. 31	House- wife, U. S.	Recurrent attack of stomach trouble. Unimpor- tant.	Cholecystitis, appendicitis, cholecystostomy.	Recurring attacks of epigastric pain, gas- tric distress, vomiting and jaundice.	None.	Well nourished; ten- derness beneath the right costal margin.	Duodenum dilated; gall-bladder contained tarry bile; appendix distended.
11	14728	F. 68	House- wife, German.	?	Cholecystitis, pancreatitis, appendicitis, cholecystostomy.	Hypochondriac pain; vomiting.	None.	Emaciated, anæmic; epigastric tenderness.	Duodenum greatly distended; gall-bladder contained black sandy bile.
12	14787	F. 58	House- wife, Sweden.	Chlorosis at 10 years. ?	Cholecystitis, pancreatitis, cholecystostomy.	Constipation about 2 years.	None.	Emaciated; anæmic.	Duodenum dilated, pancreas enlarged; gall-bladder con- tained tarry bile.
13	15443	M. 39	Machin- ist, German.	Typhoid in boyhood. ?	Gall-stones, cholecystostomy, pancreatitis, appendectomy.	Recurrent attacks of epigastric pain, with vomiting; jaundice at times.	None.	Tenderness above McBurney's point and just above the umbilicus.	Duodenum dilated, pancreas enlarged; cholelithiasis, chole- cystitis, chronic appendicitis.
14	15689	F. 48	House- wife, Sweden.	Unimpor- tant. Unimpor- tant.	Gall-stones, pancreatitis, cholecystostomy.	Recurrent attacks of epigastric pain and vomiting; no jaun- dice.	None.	Epigastric and hypo- chondriac tenderness; well nourished.	Stomach and duodenum di- lated; pylorus normal; gall- stones, cholecystitis, pancrea- titis, dark, sandy bile.

AN ANOMALY OF THE DUODENUM RESULTING IN DEATH AFTER GASTRO-ENTEROSTOMY.

BY JAMES G. MUMFORD, M.D.,

OF BOSTON, MASS.,

Visiting Surgeon to the Massachusetts General Hospital.

SURGEONS have come to think that the causes of death following gastro-enterostomy are (1) a failure of union at the site of anastomosis, with consequent peritonitis; (2) vicious circle vomiting; (3) shock, and (4) pneumonia. I am recording this case because it presents a fifth cause, a preventable cause; an abnormally short duodenum rendering inadequate and dangerous the operation of posterior gastro-enterostomy with the short loop in those cases associated with an immobilized but greatly distended stomach. So far as I know, no similar case has been reported, and the condition is somewhat rare; but it is important and interesting.

The patient's history is commonplace enough. He was a young man of twenty-nine, a motorman, who had suffered severely with gastric symptoms for five years. It was obvious that he had a greatly dilated stomach, the lower border being two inches below the umbilicus, while there was no apparent ptosis, the upper border not being visibly out of the normal position. An immovable mass, about the size of a pigeon's egg, could be felt in what was thought to be the pyloric region. It was assumed that this mass was inflammatory, and a drainage operation was advised.

Accordingly, on July 8, I opened the abdomen, and found the anticipated conditions. Fig. 1 shows them fairly well. A large part of the pyloric portion was greatly thickened, and was held up to the liver by strong and dense adhesions. No enlarged mesenteric glands were found. So the pyloric portion, owing to its great and extensive thickening, entered but little into the dilatation, which was composed of the thinned and ballooned fundus.

On turning up the omentum, colon, and stomach, and search-

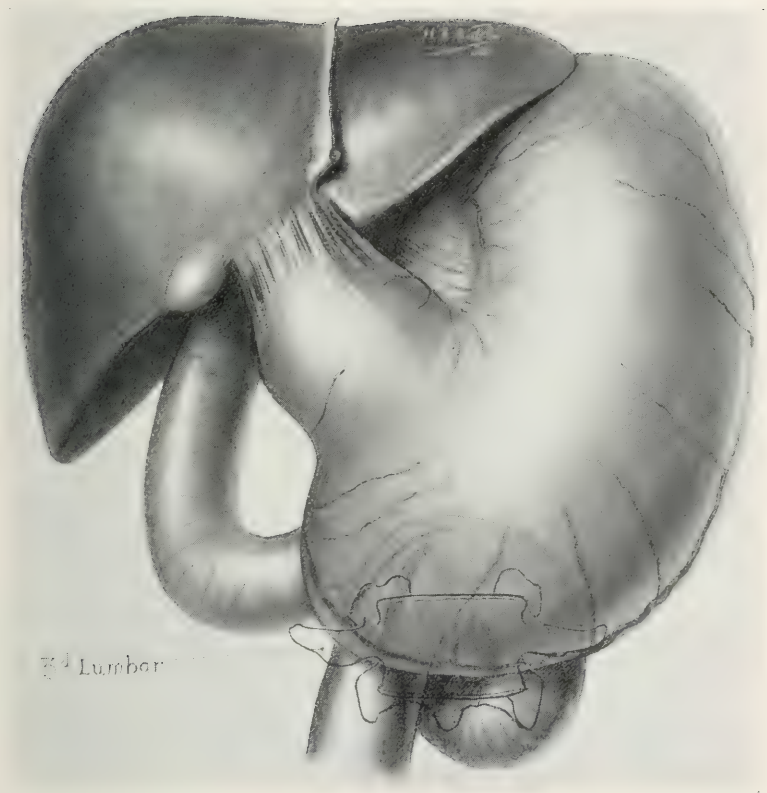


FIG. 1.

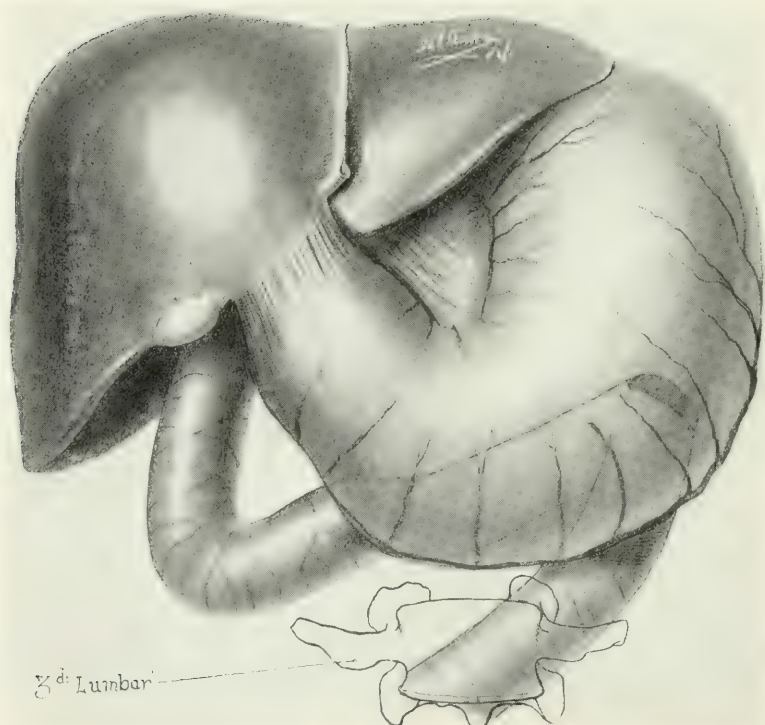


FIG. 2.

ing for the jejunum, I found that that portion of the gut did not spring from a ligament of Treitz upon the left crus of the diaphragm, but from the right crus. In other words, the fixed duodenum ended upon the right of the spinal column. I thought little of this at the time, and merely mentioned it as an interesting anomaly to my little audience. I had intended to do Finney's pyloroplasty, but, as the conditions were unsuitable, I proceeded with the familiar short-loop posterior gastro-enterostomy. The opening in the stomach was made as near the pylorus as I dared to place it, in view of the thickened and friable condition of the gastric wall at that portion. The opening in the jejunum was made about three inches from the ligament of Treitz, the fixed portion of the intestine. In other words, the play allowed to the movable stomach and jejunum was to be limited by the short radius—ligament of Treitz to anastomotic opening—afforded by the three-inch limb of jejunum; and in this patient's case the centre from which the radius sprung was upon the right of the spinal column. The anastomosis was made by stitching, without other mechanical device, and, at the end, the technique seemed to be satisfactory.

The patient bore the operation extremely well, and assured me, the next morning, that he had not felt so comfortable for years. Promptly his appetite returned, his bowels acted well, and the quality of his diet was changed from day to day as his keenness for food increased. All went satisfactorily until the fifth day. That morning he complained of some slight epigastric uneasiness, and was immediately put upon a liquid diet with bicarbonate of soda. Nothing more was heard from him until midnight, when he underwent a sudden and violent paroxysm of severe abdominal pain, associated with profound and alarming collapse. Morphia did not quiet him, and the house-surgeon was obliged to use ether. Thus the patient continued until ten o'clock the next morning (ten hours), when he died.

This catastrophe was not clearly explicable until the autopsy, when an interesting and significant situation was revealed. The abdominal cavity was found flooded with gastric contents. On exploring carefully the stomach, which appeared contracted nearly to the normal size, a large rent was found far to the left, in the fundus of the stomach. At first it was thought that this must be

the perforation of an ulcer, undetected at the operation. It did not seem probable that the anastomotic stoma could be so far from the pylorus; but on farther investigation this rent was found to be the stoma with a portion of the torn-off jejunum attached to its right-hand border. The short arm of this portion of jejunum ran to the ligament of Treitz. It was on the stretch and measured four inches from the stoma to the ligament. Fig. 2 illustrates this appearance.

A little reflection served to explain the rather surprising new arrangement of the parts, and to show what had been going on inside the unfortunate man's abdomen. So long as the stomach remained dilated, the new stoma and the efferent and afferent loops lay in easy relation, and performed their functions. With drainage and rest, however, the overdistended stomach fundus retracted towards a normal position and size. As it retracted it stretched and gradually dragged the afferent loop towards the left, until that portion of the bowel found itself drawn tightly between its fixed point, the ligament of Treitz, and its retracting point, the gastro-intestinal stoma. It gave way accordingly at its new attachment, with a result fatal to the patient. In such a case as this, it is a lamentable reflection that the more perfect the artificial stomach drainage so much the more rapid is the stomach retraction, and so much the earlier is the fatal result. In another similar case I should perform posterior gastro-enterostomy and entero-enterostomy with section of the afferent loop between the two anastomotic openings.

Unfortunately for surgeons, anomalies of the third and fourth portions of the duodenum are not so rare as many standard text-books state. Quain and Gray hold that the fourth portion ends on the left of the aorta, but recent studies show that statement to be incorrect frequently.

Several years ago, Professor Thomas Dwight tabulated the results of his observations on the duodena of *fifty-four* adults (*Journal of Anatomy and Physiology*, vol. xxxi, page 516). His findings are so strikingly at variance with the common teaching, and are so important withal, that I quote the following paragraph:

“The usual statement that the third part (of the duode-

num) crosses the aorta, presumably with no peritoneum intervening, and that the fourth ascends on its left, is incorrect. Jonnesco admits that this last part is much less firmly attached than the second and third, so that it slides easily. He states that when the fourth part ascends vertically it lies on the lower third or quarter of the left kidney. . . . In point of fact, it is only exceptionally that the fourth part is prærenal at all. In the fifty-four cases already mentioned, the duodenum was on the right of the aorta, till just before the terminal flexure, twenty-six times. It was wholly on the right six times. The fourth part lay in front of the aorta eleven times, and the third part actually crossed the aorta eleven times."

In other words, from a study of Professor Dwight's paper, it appears that that rather indefinite structure, the ligament of Treitz, may lie in front of the spinal column or even slightly to its right in from 10 to 12 per cent. of adult cases, a fact noteworthy to surgeons, especially in view of the case I have reported here.

RESECTION OF INTESTINE, FOLLOWED BY END-TO-END ANASTOMOSIS.¹

REPORT OF CASES WITH REMARKS.

BY ELLSWORTH ELIOT, JR., M.D.

OF NEW YORK.

Surgeon to the Presbyterian Hospital.

THE indications for resection of some part of the small or large intestine are well defined. Of the more frequent acute conditions may be mentioned the different varieties of gangrene, extensive damage to a loop of intestine through penetrating wounds, especially gun-shot wounds, and the destruction of its blood-supply through traumatic separation of its mesenteric attachment, or through the division of one of the terminal branches of a mesenteric artery.

Of the sub-acute or chronic conditions may be mentioned intestinal fistulæ that do not yield to less stringent measures, chronic obstruction in which coils of intestine are so firmly bound together that their successful separation is impossible and chronic benign strictures, including the tubercular and the rarer syphilitic varieties, especially if associated with intractable ulceration and cancer above the level of the sigmoido-rectal junction.

The clinical features of the acute conditions are so well understood that no special description of them is necessary. On the other hand, the clinical development of those chronic conditions not associated with external or visible change in the abdominal wall, especially of those causing stricture, is so varied and frequently so insidious that early diagnosis is impossible.

In benign stricture a tardy diagnosis does not necessarily affect adversely the chances of permanent relief through some surgical operation; on the other hand, inability to make an early diagnosis in malignant stricture diminishes greatly the chance of successful removal, and even in those occasional cases

¹ Read at the meeting of the New York Surgical Society, October 25, 1905.

in which resection is possible subsequent recurrence is greatly to be feared.

One of the greatest needs in surgery to-day is the discovery of some method by which malignant disease of internal organs can be detected in its incipient stages; and especially is this true of the organs of the abdominal cavity, for, not only in the intestine, but in the stomach and uterus as well, malignant disease, when its initial symptoms appear, is frequently beyond the possibility of successful cure. For this reason the early manifestations of malignant stricture of the colon should receive most careful consideration and analysis, although any considerable progress in facility of diagnosis can scarcely be achieved; for, in the first place, accurate diagnosis is frequently impossible because of the paucity of the symptoms. Thus, in some cases after a long period of uninterrupted health, the patient suddenly develops the symptoms of acute or sub-acute obstruction, and subsequent operation discovers a growth that must have existed for years. In the second place, even when early symptoms develop, a wide variation is seen to exist. Thus, in many, disturbances of digestion and increasing difficulty in the passage of the intestinal contents may attract attention. Under this general head, may be mentioned nausea and loss of appetite; the persistent fermentation and gas-production leading to a sense of fulness referred to some particular region in the abdomen—a feeling usually most marked from four or five hours after eating, according to the distance from the stomach to the stricture; the discomfort and occasionally, later, the actual pain, as the intestine above the point of stricture becomes more distended; the subjective sensation of relief due to the passage of the accumulated gas through the narrowed lumen below often accompanied by a marked gurgle. Such a train of symptoms should lead in every instance to repeated careful palpation of the abdomen and in doubtful cases to early exploration particularly where unusual thickness of the abdominal wall might conceal a growth of small size or where the growth lies in some deeper inaccessible part of the abdomen or pelvis.

In other cases, constipation may be the first symptom. Regularly, it should follow the group of symptoms just enumerated. After it has once appeared, it is more marked at those

times when, through the swelling of temporary congestion, the orifice of the stricture is suddenly greatly diminished. With the subsidence of congestion, constipation disappears; it is therefore an intermittent symptom. Occasionally, after ulceration has occurred, the foul discharge induces cartarrhal inflammation of the contiguous intestine and diarrhoea, sometimes with stools containing traces of pus and blood. Hence the "alternating diarrhoea and constipation" of which some authors write and which is actually an exceptional and sometimes misleading symptom, for the growth is almost always scirrhus and the resulting ulceration occurs not only at a later period but also with a discharge that is much less irritating than in the other varieties of carcinoma.

The initial appearance of constipation depends not only upon the degree of stricture but also upon its proximity to the rectum, due to the solidification of the fecal current in the lower part of the large intestine. In the sigmoid flexure, therefore, constipation is more likely to develop at an earlier period than in the upper part of the large intestine. But irrespective of the situation of the growth, constipation with subsequent obstruction develops only when the growth encroaches upon the lumen of the gut. Frequently the colon is involved with little or no diminution of its calibre and constipation is absent throughout.

Finally, in the absence of all previous symptoms, as has already been mentioned, the symptoms of sub-acute or acute obstruction may be the first indication of the presence of the growth.

The objective symptoms which need no special description are those of a tumor with or without an associated ascites and with, later on, the appearance of metastases in the liver and other parts of the body. Ordinarily this tumor cannot be felt for some time after the development of the initial subjective symptoms and even in the later stages it may, as has been stated, be concealed by a thick abdominal wall, the presence of moderate distension, or by the fact that it occupies a position inaccessible to palpation behind some viscus or below the brim of the pelvis. In the latter situation, as in Case IV, it may be felt by rectal examination.

It is also important to note that even under favorable

conditions, a most careful examination may fail to detect the growth a day or two after its successful palpation near the anterior abdominal wall (as in Case III, prior to operation) and also the fact that it may be felt in different parts of the abdomen in successive examinations. Both of these last mentioned variations are most likely to occur in growths that involve any portion of the alimentary canal that is provided with a mesentery and that have not as yet become adherent to immovable parts (in Case III, the ileum, in Case IV, the sigmoid). In the transverse colon a similar degree of mobility might be enjoyed, but in the four ascending or descending colons growths could possess at the very best only a slight range of movement.

The indications for resection in the treatment of stricture admit of little if any discussion. On the other hand, the means by which the patency of the canal shall be re-established vary greatly. Each particular method and each almost unending modification of that method have their adherents, and the investigator who endeavors to unravel the much-vaunted advantages of this or that proceeding encounters a confusing mass of incompatibilities and contradictions.

It is not the intention of the writer to discuss the comparative value of end-to-end, end-to-side, and side-to-side, methods of anastomosis, nor whether anastomosis is preferably accomplished by suture alone or with the aid of some artificial appliance. Much depends upon the condition of the resected ends as well as upon the general condition of the patient, which may be such as to demand the greatest speed. If no special hurry is necessary and if the resected extremities are of equal calibre and of normal appearance and consistency, it is the writer's opinion that any one of several methods will yield satisfactory results, preference being naturally given to that one to which the operator is accustomed. The method of end-to-end anastomosis, of which a brief description follows, is therefore not introduced by the writer as one necessarily superior to those in general use, but merely as one that has given satisfactory results, and seems, in the few cases reported, to have protected the patient from the dangers of a perforative peritonitis.

After the removal of the damaged or diseased intestine

and after the exposed ends have been prepared for suture in the usual way, those portions of the circumference included between the layers of the mesentery are carefully united with two or three interrupted sutures of chromic gut. In the small intestine, where this interval is narrow, one or two are sufficient; in the large intestine, where this interval is much wider, three or even four may be used.

Advancing then to either side alternately of the mesenteric attachment, similar sutures are passed between all the layers of the wall of the intestine except the serous coat and tied (with the exception of the last two or three) from within. In the process of repair, therefore, this first row of sutures should be discharged into the lumen of the gut. A second row of interrupted Lembert silk sutures is now passed around from one side of the mesenteric attachment to the other, the first and last sutures being inserted respectively on either side close to the junction of the mesentery and intestine.

If the sutured ends of the intestine are of normal appearance and free from congestion, the abdominal wound is then closed without further precaution or drainage, except in the sigmoid flexure, where a small cigarette drain may be passed down to the sutured gut. If, on the other hand, either of the resected ends is unduly congested, or friable, or of unequal size, even although the viability is unquestioned, the sutured loop may be fastened to the anterior parietal peritoneum by one or two plain cat-gut sutures and a small drain of gauze inserted on either side. In this way, subsequent leakage which under these circumstances is extremely likely to take place, may be conducted into the dressing, thus obviating the danger of a peritonitis.

In the sigmoid the integrity of the suture line from the distension of the upper segment with either gas or feces may be protected by insertion through the rectum to a point beyond the line of suture, of a rubber tube. This should be introduced by an assistant and guided by the surgeon's finger in the abdominal cavity to the desired point. The wound is then closed in the usual way, after the insertion of a small cigarette drain.

CASE I.—*Strangulated Inguinal Hernia; Necrosis of small Intestines: Resection; Recovery.*—T. M., male, aged thirty-five years; admitted to the Gouverneur Hospital, June 21, 1903.

Patient had had a reducible oblique inguinal hernia for the past ten years. During the latter part of that time he has had several attacks of acute irreducibility, all of which yielded to taxis and palliative treatment. Yesterday, while engaged in lifting, the hernia again became irreducible, and patient was seized with great pain and vomiting. All attempts at reduction failed.

On examination, there is an irreducible swelling in and occupying the region of the left inguinal canal, which presents all the usual symptoms of a strangulated hernia. The swelling extends a short distance below the external ring into the scrotum.

Operation.—Under ether anæsthesia, the hernial sac was exposed by the usual Bassini method. It contained considerable bloody serum, free from odor and a loop of small intestine of dark color and which, although without perforation at the point of constriction, yet was suspiciously flaccid over an area of about two inches in width. It had not yet lost its glistening appearance.

Owing to the doubtful viability of the exposed gut, which after the relief of the constriction (at the internal ring) still retained its dark color and flaccid consistency, its wall was sutured to the margin of the internal ring and a temporary warm dressing was applied. At the end of twenty-four hours, gangrene was established beyond a doubt and resection with end-to-end anastomosis was immediately done. With the completion of the anastomosis, a small wick of gauze was passed down into the abdominal cavity along with the sutured intestine and the remaining part of the wound was closed as far as possible according to the Bassini principle.

At no time during either operation or during the twenty-four hours intervening was the patient's pulse over 100.

Post-operative.—There was little if any reaction, the temperature and pulse both remaining below 100. There was instant cessation of vomiting, and in the course of twenty-four hours passage of flatus from the rectum. There was no distention. During the third day discharge of fecal matter appeared in the wound. This became very abundant but did not represent the entire intestinal contents, as the bowels moved regularly after the second day. The color and consistency of the fecal discharge

corresponded to that ordinarily found in the upper part of the small intestine. At the expiration of a week, it had greatly diminished in amount and before the end of the third week had entirely disappeared. At no time was the general condition of the patient materially weakened.

The wound closed rapidly and at the end of the fifth week, the patient left the hospital.

The patient was examined occasionally during the next twelve months; at the end of which time no recurrence had taken place. Owing to the fact that the wound was left open at its inner angle a late recurrence may be expected.

CASE 2.—T. I., aged forty-seven years; admitted to the Presbyterian Hospital, February 21, 1903. For the past fifteen years, patient has had a reducible right inguinal hernia. During the past five years, the hernia has been satisfactorily held back by a truss. This morning, however, while straining at stool, the hernia became irreducible and painful, slipping down behind the truss. There was some nausea but no vomiting, and the bowels moved to enema freely on both the 21st and 22d.

On examination, there is a right irreducible oblique inguinal hernia, extending down to the testis. There is a distinct expansile impulse on coughing. The swelling, though not painful, is moderately tender. There is slight indefinite pain referred to the lower part of the epigastrium in the middle line. The temperature ranges between 99 and 100, the pulse about 90 to 100.

The foot of the patient's bed was raised by shock blocks and an ice cap applied to the swelling.

February 22. Vomited some broth to-day at noon. No vomiting had occurred at any previous time. Discharge of flatus and a small amount of fecal matter from the bowel. There is more pain and some fulness in the lower part of the epigastrium. On palpation in this region, there is slight tenderness and rigidity.

February 23. Bowels moved to-day with enema. There was one attack of vomiting after taking broth in the morning. There is some restlessness. The hernia is gradually decreasing in size.

February 25. During the night, there was intense abdominal pain with considerable hiccough, interfering with sleep. There was one attack of vomiting during the afternoon and again in the evening. Two movements of the bowels, secured by enema, gave relief. Patient does not look seriously ill.

February 26. A repetition of yesterday. Pulse has not been over 88 at any time since admission and the temperature is normal.

February 27. Another good result from enema. There is still occasional vomiting after taking food.

February 28. To-day, for the first time, visible peristalsis appeared in the right iliac fossa with slight distention of the lower part of the abdomen. Patient feels cramp-like pains which disappear with inward rumblings of gas. There is some rigidity in the lower right quadrant above the situation of the internal ring. General condition unchanged.

During the next forty-eight hours, the hiccoughing and vomiting became less, but the rigidity and distention continued unabated and the bowels moved with increasing difficulty.

Operation.—Ether. A median incision below the umbilicus was made, and the peritoneal cavity opened. There was a small amount of free serous odorless fluid. Over toward the right side, in the lower quadrant, the small intestine was congested and swollen and the loops were smeared with fibrine. Almost immediately, on the separation of these soft adhesions an abscess cavity was opened, and at the wall of internal ring at a point where it had been constricted by the margin of the interna (an adjacent loop of small intestine) an orifice was seen, through which intestinal contents escaped. Another constriction was seen in the loop at a distance of six inches, but this had not given way. The damaged loop which was very friable was resected, followed by end-to-end anastomosis, and after the insertion of several small wicks of gauze, the closure of the remaining part of the wound.

Post-operative course.—Owing to an associated endarteritis, the patient's general condition remained poor for several days, the pulse ranging from 120 to 140, although the temperature was below 100. There was, however, no sign of peritonitis and on the day following operation considerable flatus was expelled through the rectum. On the fourth day, after repeated small doses of phosphate of soda, the bowels moved several times. On the fifth day after operation, at the time of the second dressing, a slight fecal discharge was noticed. On the tenth day, the fecal discharge was quite abundant, but from that time on, rapidly decreased and had entirely disappeared by the 24th day, leaving a healthy granulating surface which slowly cicatrized.

On May 8, patient left the hospital, completely healed, having gained between 20 and 30 pounds in weight.

On examination one year afterward, the patient's general condition was excellent and there was no recurrence of the hernia.

Bacteriological examination of the pus showed the presence of the bacillus coli communis, while that of the excised intestine showed "beginning necrosis."

CASE 3.—H. K., male, aged sixty years; admitted to the Presbyterian Hospital, May 1, 1903. Patient was always well until seven months ago. At that time, without known cause an attack of abdominal pain and vomiting occurred, lasting but a few hours. These attacks have recurred every three or four weeks and recently have lasted for a week or ten days with a sense of obstruction to the passage of the intestinal contents. Vomiting has always occurred shortly after the taking of food, the vomitus consisting of the contents of the stomach and never containing blood in any form. There has been constipation for the past three months, the bowels moving every three days to catharsis.

On examination, there is intermittent moderate distention of the central part of the abdomen. This usually disappears after a movement of the bowels, and at that time, a small ovoid hard tumor can generally be felt in the right iliac fossa. Occasionally no mass can be felt in this situation. Examinations of the stomach and rectum negative.

Operation.—Gas and ether. Under ether no tumor could be felt. An incision below the level of the umbilicus along the outer margin of the right rectus muscle was made and the peritoneal cavity opened. The affected loop of small intestine was easily found directly in front of the promontory of the sacrum within the cavity of the true pelvis and presented a hard nodular tumor, involving its entire circumference, situated about ten inches from the ileo-cæcal junction. The lymphatic glands in the adjacent portion of the mesentery were hard and nodular even as far as its vertebral attachment. This extensive lymphatic involvement necessitated the removal of about eighteen inches of small intestine. An end-to-end anastomosis was then done, and the abdomen closed without drainage.

Post-operative.—Primary union was secured. Flatus was expelled by the rectum and a movement occurred on the first

day after operation. Rectal alimentation was carried out for forty-eight hours and then small quantities of peptonized milk were given. There was no vomiting or distention at any time after the operation.

On gross examination, the tumor appeared to be a scirrhus carcinoma involving the entire circumference of the intestine and diminishing by at least one-half the patency of its lumen. On microscopic examination, the tumor proved to be an adenocarcinoma.

Six months after the operation, the patient had gained sixty pounds and worked without interruption. The bowels were regular and he was free from pain. About ten months after operation evidences of recurrence appeared in the liver from which the patient died one year after his discharge from the hospital.

CASE 4.—J. E. R., male, aged forty-nine years; referred by Dr. Conkey. Admitted October 22, 1903. Father died of cancer of intestine. With the exception of scarlet fever when a child, an attack of acute articular rheumatism when twenty, and an occasional attack of bronchitis during the winter, patient was always in excellent health until August, 1902, when he first noticed pain in the left side. The pain was usually in the vicinity of the anterior superior spine and was of a burning character. Occasionally it was so severe as to be scarcely endured. The stools were loose and blood-stained and contained shiny matter. The patient was treated for hemorrhoids without any local examination being made. Since that time, there has been gradual loss of flesh and strength. At present, the chief complaints are pain in the left flank, anorexia, general weakness and attacks of diarrhœa with bloody stools.

By rectal examination, a mass can be made out high up through the posterior rectal wall, freely movable from side to side. On bi-manual examination the same mass can be distinctly outlined in the median line midway between the navel and the umbilicus and is about the size of a small orange, hard and nodular. It is freely movable from side to side. There is no evidence of hemorrhoids. There is no glandular enlargement in any part of the body.

Operation.—Incision in the median line, four inches in length, above the symphysis pubis. On opening the peritoneal cavity

a tumor was found near the centre of the sigmoid, involving its entire circumference for a distance of three inches and being from two to three inches in diameter. It was very hard in consistency, evidently of the scirrhus type and accompanied by glandular involvement in the meso-sigmoid nearly as far as the vertebral column. About seven inches of the sigmoid and a corresponding amount of its mesentery, containing all the involved glands, were removed followed by end-to-end anastomosis. A small cigarette drain was inserted to the point of suture after the return of the intestine and a rubber tube was passed through the rectum to a point beyond the suture line. Closure of the abdominal wall.

Post-operative.—Scarcely any vomiting followed the operation. There was little if any reaction and the abdominal wound healed by first intention, the pulse never rising above 100. The drain was withdrawn on the third day and not re-inserted. The bowels moved on the fifth day to small doses of calomel and salts. At the end of the second week patient was placed on regular diet. At the time of discharge, patient says that he is entirely free from the pain of which he complained prior to the operation. The diarrhœa had ceased, the bowels moving regularly with slight discomfort.

Two years after the operation, patient reports that with the exception of occasional constipation, he is perfectly well. The microscopic examination of the growth shows it to be an adenocarcinoma.

Case 5.—P. H., aged sixty-five, referred by Dr. Niesley. Admitted to the hospital, February 3, 1904. Wife is said to have died of "cancer." Patient has always enjoyed excellent health. About four weeks ago, patient suffered from an attack of constipation with mild obstructive symptoms, which did not yield readily to catharsis. The last satisfactory movement occurred sixteen days prior to admission and since that time there have been only occasional small movements with the passage of gas after enemata. During this period there has been nausea with occasional vomiting and a variable degree of distention. There has been no loss of flesh and nothing abnormal in the character of the stool.

On examination, there is general endarteritis and moderate distention of the abdomen. No growth can be felt either through the abdominal wall or by rectum.

Operation.—Gas and ether. A median incision was made above the symphysis pubis and the peritoneal cavity opened. The sigmoid was examined and found in its upper part to be the site of a hard scirrhus growth with beginning glandular involvement. The intestine above the growth was moderately distended and congested. The growth involved the entire circumference of the gut. About four inches of the sigmoid and the contiguous mesentery were removed, followed by end-to-end anastomosis. Owing to the congested condition of the upper end, a small opening was made through its wall after the suture had been completed and a tube introduced toward the descending colon. It was thought that, by this means, the fecal current could be temporarily deflected until the congestion had subsided and the danger of leakage averted. The remainder of the abdominal incision was closed in the usual way.

Post-operative.—Patient developed considerable nausea and vomiting immediately after the operation, which, notwithstanding lavage, continued to his death. There was no abdominal pain, no rigidity or distention, and patient had several large soft fecal movements through the rectum within twelve hours after the operation had been concluded. There was no discharge of fecal material through the tube inserted into the descending colon until the second day. Patient died on the third day from heart failure due to the poor condition of his arteries.

Microscopic examination showed the growth to be an adenocarcinoma.

REMARKS ON CASES.

CASE I.—This case of strangulated hernia is of interest in that the gut, after the constriction was divided, was exposed for 24 hours beneath a temporary dressing before the question of gangrene could be determined. This same procedure was followed in a similar case reported in the Presbyterian Hospital report of 1902, in which the suspicious gut eventually proved viable. The delay in the completion of the operation in both cases did not seem to jeopardize the recovery of the patient.

The development of the fecal fistula was expected and was associated with no general constitutional disturbance. From the nature of the discharge an artificial anus would probably have resulted in the subsequent emaciation and star-

vation of the patient. As a matter of fact, the absence of any disturbance of nutrition in the present instance was due to the short duration of the fistula as well as to the fact that, even when at its height, a sufficient amount of intestinal contents passed down the normal channel to form movements of moderate size and frequency.

Examination of the affected segment showed a necrosis more advanced in the mucous membrane than in the serous coat. The lumen was partially filled with most offensive fluid material.

CASE II.—The clinical features in this case of strangulated hernia are surely most atypical and unexpected. Notwithstanding that the contents of the sac were returned into the abdominal cavity by the gentle pressure of an ice-cap and by the raising of the foot of the bed without taxis or manipulation of any form, the primary constriction had been sufficiently severe to determine the gradual necrosis of the affected loop. That this should have taken place without local pain and with the presence of normal expansile impulse, with but slight nausea and attacks of vomiting separated by considerable intervals, with the almost daily movement of the bowels and with the frequent passage of flatus, is certainly most exceptional. As, however, the bowel became necrotic, paralysis of its muscle fibre led to the development of the symptoms of sub-acute obstruction. At the operation a small abscess was found, moderately circumscribed, containing bacilli coli communis, the result of the perforation which had taken place at one point of the constriction in the affected loop. Here again, because of the friable and congested ends of the gut and the presence of an abscess, a fecal fistula developed, but its prompt closure took place as the process of repair by granulation became advanced.

CASE III.—This case of adeno-carcinoma in the small intestine is of interest because of its rarity and, secondly, because of the resemblance of its clinical features to those occurring in malignant disease of the stomach, the nausea and vomiting occurring regularly within a short time after eating. Examination of the stomach contents, however, showed nothing abnormal and physical examination detected the growth in the lower right side of the abdomen, except when it was temporarily absent in the pelvis.

The short existence of the symptoms prior to the admission of the patient into the hospital is a forceful illustration of the fact that these growths may reach an advanced stage of development before the first symptoms appear.

CASES IV AND V.—The clinical features of Cases IV and V are those of more or less typical carcinoma of the sigmoid. Here again the comparatively short duration of the symptoms must be noted.

In this situation, the subjection of the suture line to the mechanical irritation and pressure of solid fecal material warrants the insertion of the abdominal drain, although some protection is afforded by the passage of a tube into the lumen of the gut above the point of suture.

In the first case the result proved most satisfactory and the patient is still free from recurrence. In the second case, unfortunately the general condition of the circulatory system was chiefly responsible for the patient's death. The method had, however, proved its value in that at no time after the operation was there any evidence of leakage or peritonitis.

In conclusion, it seems desirable to call attention to the danger of subsequent leakage in end-to-end anastomosis when the resected ends of the intestine are unduly congested or friable. This seems to have been the cause of the patient's death in many of the cases reported in the current literature on this subject. That this unfortunate termination can sometimes be averted by the method here suggested seems reasonable. If, however, the abdomen is to be tightly closed without the safeguard of moderate drainage or of temporary anchorage of the affected loop to the parietal peritoneum, then side-to-side anastomosis with the closure of the resected ends by the purse-string suture seems to yield the most satisfactory results. If the condition of the resected ends is normal, however, end-to-end anastomosis without drainage (except in the sigmoid) can be adopted without fear of subsequent peritonitis.

A TRANSVERSE INCISION FOR THE REMOVAL OF THE APPENDIX.¹

BY GWILYM G. DAVIS, M.D.,

OF PHILADELPHIA.

THE most popular incision at present for the removal of the appendix is probably that first described by Battle (*Brit. Med. Journ.*, 1895, ii, p. 1360) and later by Jalaguier (*La Presse Médicale*, 1897) and Kammerer (*ANNALS OF SURGERY*, 1897, xxvi, 225). It is made along the outer edge of the rectus muscle, and the skin being drawn toward the median line the anterior layer of the sheath of the rectus is incised longitudinally. The rectus is then displaced inwardly, and such portion of the sheath as may be present, and the transversalis fascia and peritoneum incised posteriorly. This operation was modified by Lennander (*Cent. für. Chirurg.*, 1898 xxv, 90) and Edebohls (*Med. Record*, 1899, p. 665) by going directly through the fibres of the rectus instead of drawing it to one side and the method is used at least by many for all kinds of cases, suppurative and otherwise.

The operation of McBurney (*ANNALS OF SURGERY*, 1894, vol. xx, p. 38) is also frequently used. He made an incision four inches long in the direction of the fibres of the external oblique about one inch from the anterior superior spine crossing a line drawn from it to the umbilicus nearly at right angles. One third of the incision is above this line. The external oblique fibres were divided in the line of the skin incision and the internal oblique and transversalis fibres parted in a direction nearly at right angles to those of the muscle above.

Harrington (*Boston Med. and Surg. Jour.*, Aug. 1899) and Weir (*Med. News*, Feb. 17, 1900, 241) suggested continuing the separation of the internal oblique and transversalis inward by dividing the sheath of the rectus and pulling it toward the median line. This was done in order to obtain additional room in cases in which the McBurney incision had

¹ Read before the Philadelphia Academy of Surgery, October 2, 1905.

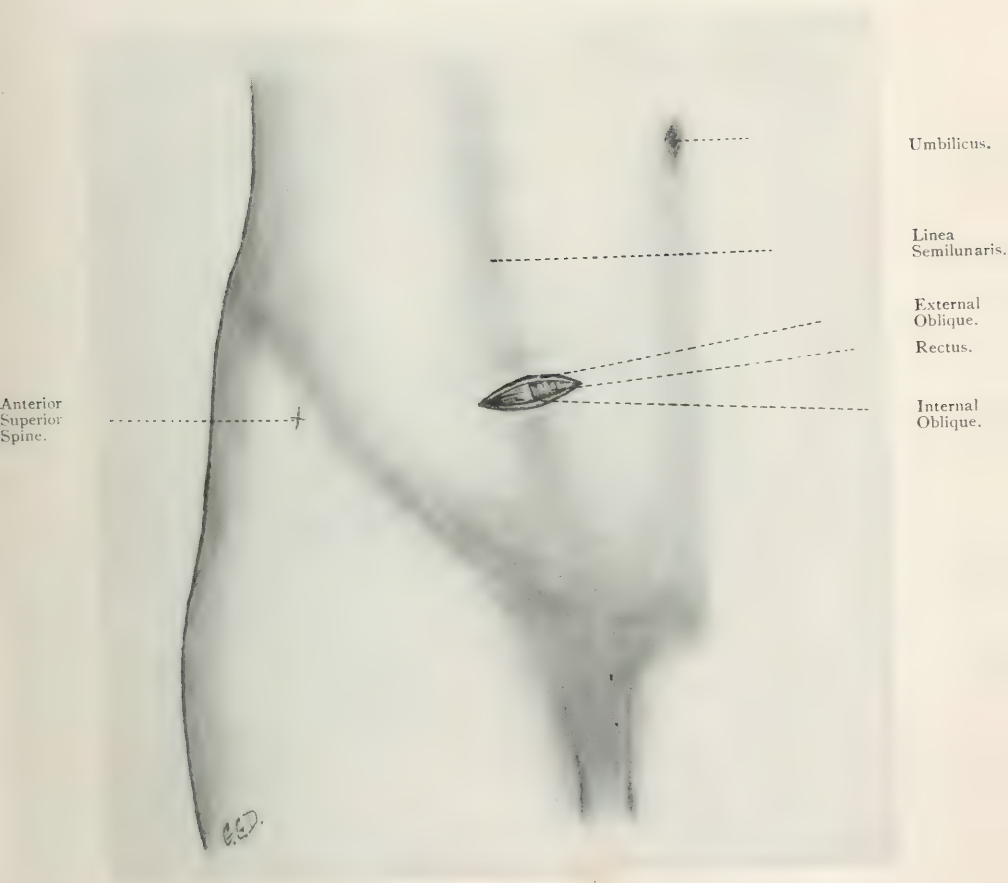


FIG. 1.—Small incision for simple cases.

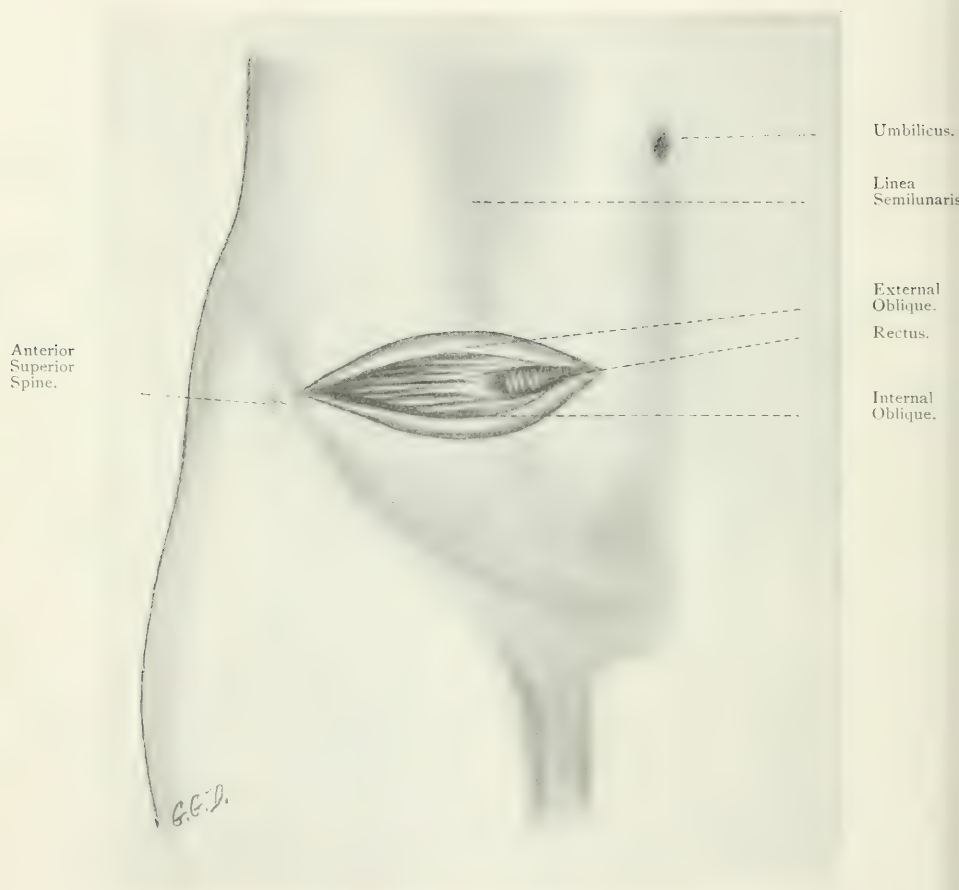


FIG. 2.—Large incision for difficult cases.

been found to be insufficient. Quite recently I have come across the paper of J. W. Elliot, (*Boston Med. and Surg. Journal*, 1896, vol. ii, p. 433) which seems to have been overlooked by most surgical writers. He made his incision beginning at half an inch inside of the linea semilunaris. The external oblique was divided in the line of the skin incision and the internal oblique and transversalis were divided in the direction of their fibres and in the line of the incisions above. If more room was desired he suggested that the incision could be prolonged along the linea semilunaris or into the rectus muscle if necessary.

It is thus seen that there are three ways of operating—one through the sheath of the rectus longitudinally, another by McBurney's operation with the Harrington and Weir addition and the third the transverse incision of J. W. Elliot through the external and internal oblique and transversalis muscles.

Of the longitudinal incision of Battle and its modification of going directly through the rectus the former seems the better for the following reasons: The incision through the muscle weakens it at this point. In Battle's operation the rectus presents an intact muscle to resist the inside pressure and the incisions through the sheath are overlapped by the muscle slipping back into place. In the modified operation there is left a straight scar from the skin to the peritoneum. Division or parting of the muscle is certain to wound some of the branches of the deep epigastric artery or even sometimes the main trunk. This is more apt to be the case if the fibres are parted from above down than from below up. In longitudinal incisions generally the nerves supplying the rectus are liable to be cut through as well as the vessels. These nerves are motor in character as well as sensory and come from the tenth, eleventh and twelfth intercostals. If cut they, like other motor nerves, do not tend to unite. If large incisions are needed the amount of muscle paralyzed is considerable. If drainage is used it is brought out directly through the lower angle of the wound and it is needless to point out how favorable this is to the production of hernia.

Paralysis of a part of the rectus is recognized by, first, the operated side of the abdomen protruding more than the sound

side and, secondly, by observing that when the rectus contracts the scar is dragged up by the uninjured part of the muscle while the paralyzed lower portion offers no resistance. Another objection to incising the sheath of the rectus pointed out to me by Dr. Porter is that infection may travel along beneath it instead of coming up to the surface. McBurney's operation is good in easy cases but in difficult and suppurative operations it does not give sufficient room and makes a nasty wound if infected and unsuitable for efficient drainage. The operations of Harrington and Weir possess all the objections of the McBurney with the exception of the slight additional space gained by displacing the rectus.

Proposed Incision.—For easy cases the incision is made directly transverse one and a half inches long. Its center is to be on the semilunar line on a level with the anterior superior spine. The aponeurosis of the external oblique is divided in the line of the skin incision but obliquely to the direction of its fibres. The fibres of the internal oblique and transversalis muscles are parted—not cut—in the same line as the structures above. The peritoneum is then opened and the incision carried inward through first the anterior layer of the sheath of the rectus. A blunt retractor three-quarters of an inch wide is then inserted and the muscle drawn toward the median line. This exposes the transversalis fascia and peritoneum posteriorly which are then also divided. Thus is obtained a triangular opening with its base of three quarters of an inch and two sides of about an inch long which is ample for simple cases.

For Difficult Cases.—If the case is a difficult one the outer end of the incision is prolonged to the anterior spine or even above and inwardly through the sheath of the rectus to within an inch of the median line. This will give an opening four to five inches long according to the size of the patient, sufficiently large to insert the hand if necessary and through which the appendix can be extracted under almost all circumstances.

The operation was developed as follows: Previous to about eight years ago the incision parallel to Poupart's ligament dividing all structures in the line of the skin incision was used. About that time, desiring to avoid the transverse division of the muscular fibres of the internal oblique and transversalis, the incision was made higher up on the abdomen,

practically Elliot's operation. It began where a line from the femoral artery to the umbilicus crossed the linea semilunaris (about opposite the ant. sup. spine) and went outward and slightly upward toward the crest of the ilium. In cases requiring a large incision room was obtained outwardly and the ascending branch of the circumflex iliac artery was divided. It was to avoid doing this that for the past two years the incision as above described has been used. The center of the incision on the linea semilunaris opposite the anterior spine is almost over the base of the appendix. Sometimes it is higher, more rarely it is lower, in either case it is easily within reach. The ileo cæcal junction lies three-quarters of an inch above the base of the appendix so that one serves as a guide to the other. The incision is designed to avoid wounding arteries. The deep epigastric always enters beneath the edge of the rectus muscle below the level of the anterior superior spine and its main trunk is out of the way. To divide and ligate the epigastric vessels as suggested by Weir appears to be an objectionable and unnecessary procedure. As the deep epigastric proceeds upward it lies on the under surface of the muscle at about its middle or often a little toward the outer side, sending branches to each side, the larger ones going outward. They are usually drawn aside when the muscle is retracted even in extensive operations.

At the outer angle of the wound no vessels will be divided unless the incision is carried upward and backward beyond the anterior spine as the ascending branch of the deep circumflex iliac is given off and proceeds upward just above the anterior spine. As the deep muscles are divided in the direction of the nerves these are not injured as occurs in longitudinal incisions through the rectus. The appendix in this incision is particularly accessible because its center lies almost over the base of the appendix. In the longitudinal incisions through the rectus they lie to the inner side of the base of the appendix and if it points to the right and is retro-cæcal the operator encounters the objection pointed out by McBurney of having to work outward under a shelf of tissue made by the outer margin of the wound.

In cases in which drainage is necessary the drain is brought out at the outer angle of the wound and lies close to

the bony anterior superior spine and passes through the thick muscular mass of the internal oblique and transversalis, all of which ensures against the formation of a hernia at that point.

The inner portion of the wound is protected absolutely against hernia by the rectus muscle, and to its outside there are the thick internal oblique and transversalis muscles beneath, and above them the aponeurosis of the external oblique. The aponeurosis of the external oblique does not blend with the sheath of the rectus at the linea semilunaris but joins it at about one-third of the distance between the linea semilunaris and the linea alba. The division of the external oblique aponeurosis obliquely instead of parallel to the direction of its fibres may be urged as an objection but this is more than compensated for by the better access which is afforded. No hernias have come under my observation even in suppurative cases.

THE RADICAL CURE OF DIRECT INGUINAL HERNIA.¹

BY GWILYM G. DAVIS, M.D.,
OF PHILADELPHIA.

THE radical cure operations for both oblique inguinal and femoral hernias are fairly well understood and satisfactory. Direct hernia is much less frequent, not so well understood and not infrequently its operative treatment is quite difficult and not always satisfactory. The direct hernias which have come under my notice have presented themselves in two forms. One form pushes its way through the conjoined tendon and comes out of the external ring. It possesses as its coverings the peritoneum, sub-peritoneal fat, transversalis fascia and thinned conjoined tendon, and intercolumnar fascia, all usually more or less matted together. The other form bulges around the outer edge of the conjoined tendon and gradually decreases in size as it extends out toward the deep epigastric artery. It is pear shaped rather than spherical in form.

In this form we might expect to see the remains of the obliterated hypogastric artery going over the sac, but I have seen no evidence of it: possibly it has been pushed to the inner side behind the edge of the rectus muscle. It is recognized that when muscular and tendinous tissues are thick and abundant the operations for the radical cure of hernia are quite satisfactory and easy of performance. It is just the opposite condition that is confronted in direct hernia. The relation and construction of the conjoined tendon should be borne in mind. This tendon which is formed by the fusing together of the aponeurotic tendons of the transversalis and internal oblique muscles at the linea semilunaris passes over the rectus muscle and is almost immediately joined by the aponeurosis of the external oblique to form the sheath of the rectus. Thus it is seen that the insertion of the conjoined tendon and sheath of the rectus

¹ Read before the Philadelphia Academy of Surgery, October 2, 1905.

are practically the same. The sheath below the fold of Douglas is entirely in front of the muscles. Posterior to the muscle is transversalis fascia only. As the sheath descends it inserts into the crest of the pubis its spine and a short distance—about an inch—along the ileo pectineal line. The outer or lower edge of the conjoined tendon (sheath of rectus) fuses into and blends with the transversalis fascia as it goes out to the deep epigastric artery. This being the case the conjoined tendon has no free edge unless it is made by the knife dissecting it away from the transversalis fascia beneath.

Below, lying on Poupart's ligament is the spermatic cord covered by the fibres of the cremaster. The cremaster is nothing more than the lower edge of the muscular fibres and connective tissue of the internal oblique continued down over the cord.

In performing a radical cure of oblique hernia these cremaster fibres are sometimes quite abundant and may, as I have done, be utilized in closing the canal, but in direct hernia they are apt to be too scanty to be of any service. In oblique hernia the gap from the deep epigastric artery to the spine of the pubes is closed by bringing down the internal oblique muscle and conjoined tendon and sewing them beneath the cord (Bassini) to Poupart's ligament; but in direct hernia these tissues are so scanty that they are insufficient for the purpose. The suggestion of Halsted to take a flap from the sheath of the rectus and turn it outward I have never tried. The usual method resorted to to reinforce this weak spot is that of Wölfler and Bloodgood of opening the sheath of the rectus and dragging its fibres outward and sewing them to Poupart's ligament. The incision for exposing the rectus is shown in Fig. 1. The external oblique has been turned back exposing the internal oblique. The conjoined tendon is drawn up and in by a retractor introduced beneath it out toward the muscular fibres. The incision is then made from the muscular fibres toward the spine of the pubis. This incision is practically made through the lower edge of the conjoined tendon because this latter fades away into the transversalis fascia in the direction of the deep epigastric artery. The transversalis fascia is then pushed back from the posterior surface of the rectus and the conjoined tendon (sheath of the rectus) raised up from

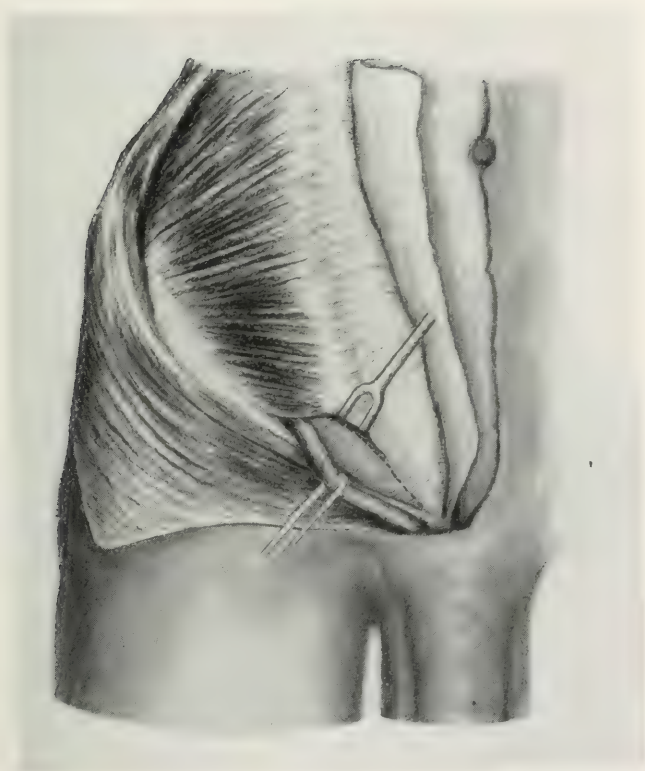


FIG. 1.—Showing incision from muscular fibres of the internal oblique to the spine of the pubis, to expose the edge of the rectus muscle

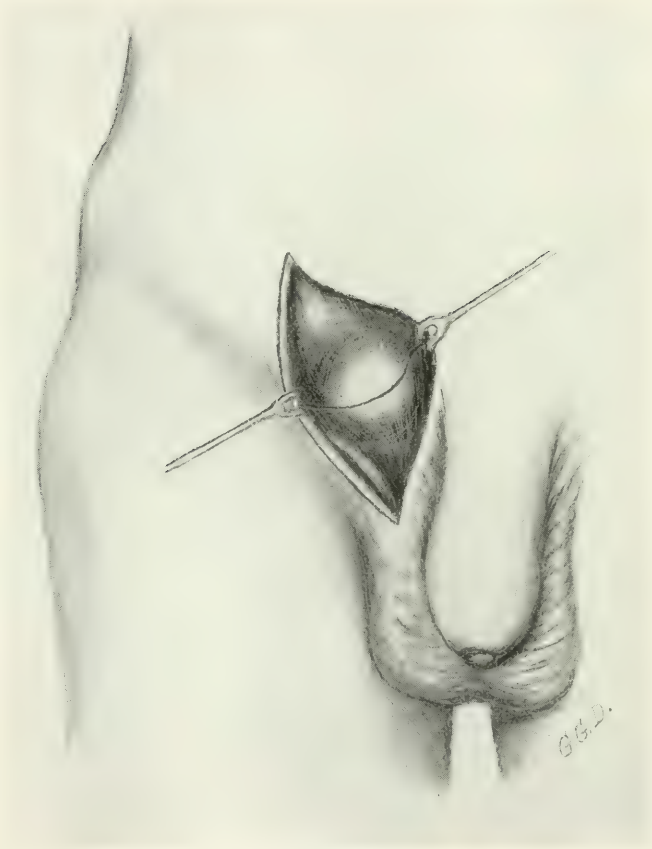


FIG. 2.

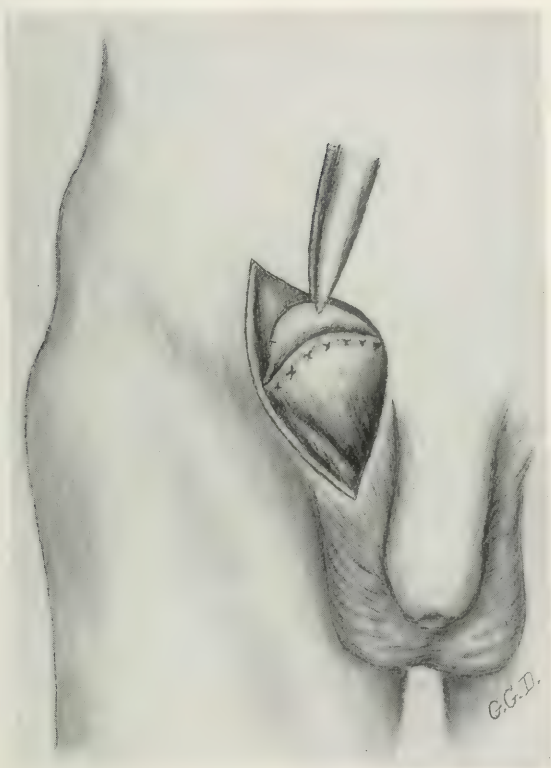


FIG. 3.



FIG. 4.

its anterior surface. Personally I have not been able to draw the rectus as far out as Bloodgood advises.

After having transplanted the rectus as far out as possible then the arching fibres of the internal oblique and conjoined tendon are to be brought down and sutured to Poupart's ligament beneath the cord as in Bassini's operation. The external oblique is then sutured as desired (overlapped or not) over the cord.

In operating on the other form of direct hernia an entirely different state of affairs is presented. The rounded hemispherical tumor presents itself just above the position of the external ring with the cord below. One of two conditions will be found. Especially when the hernia is an old one the hernial coverings from the intestine within to the superficial fascia without will be a single thick strong membrane incapable of being separated into layers. When such a condition is found in several cases I have divided the sac transversely and overlapped its two parts, suturing the apex of the lower flap to the base of the upper and then bringing down the upper flap and, suturing it in place as is done in the Mayos' operation for umbilical hernia. They dissect off the peritoneum but I believe it is better not to do so because it is firmly blended with the other tissues and adds considerable to the strength of the flaps, whereas alone it is too weak to be of much service. (See Figs. 2 and 3.)

In some other cases the peritoneum is not adherent to the conjoined tendon and intercolumnar fascia in front but has a layer of fat between. When such is found, the fat may be scraped away and the two laid together and treated as a single layer and overlapped as already described or some other method may be resorted to. The treatment of these direct hernias is not entirely settled and different methods must be used for different conditions. As the overlapping plan has been found to work satisfactorily in cases of oblique inguinal hernia (Andrews) and umbilical hernia (Mayo) so I believe will it also be found of value in certain cases of direct inguinal hernia.

THE RADICAL CURE OF SEVERE FEMORAL AND INGUINAL HERNIA.

BY JAMES H. NICOLL,

OF GLASGOW,

Professor of Surgery in the Andersonian College.

THE method of operating here dealt with is applicable to both femoral and inguinal hernia. Its main features are:

(a) The employment of the sac to form an intra-abdominal buttress over the internal aspect of the hernial opening or ring; (b) the use of the pubic ramus as a *point d'appui* in the process of closure of the hernial canal, and (c) the additional security of closure obtained by the superposition on the bone sutures of a plane of fascial sutures.

Its application to femoral hernia was described in the *British Medical Journal* of November 8, 1902, with a modification described in the *Scottish Medical and Surgical Journal* of December, 1903. Its employment in inguinal hernia was described briefly in 1905, and is here published for the first time *in extenso*.

It is not a difficult operation, and whatever extra work is involved in the drilling of the bone is compensated for in the firm closure secured in the hernial canal. In looking to results obtained, it is necessary to differentiate in the cases treated as between cases not specially severe, on the one hand, and severe cases on the other. In ordinary cases the method gives results as good as, but no better than, many of the methods in use. In severe cases, cases of large hernial aperture, of lax and atrophic parietes, or high intra-abdominal tension from omental corpulence, the method, with its double closure of the canal by bone suture, followed by musculofascial suture, attains a high degree of security. In femoral hernia I have of late employed the method in practically all cases, though at first designing it for severe cases only. In inguinal hernia I

have as yet made use of it only in severe cases, finding other and simpler methods answer for ordinary cases.

Femoral Hernia.—Of formal operations for femoral hernia there are many. The simpler operations include the “purse-string” suture of Cushing, Fortunato,¹ Curtis,² and others, popularized by Coley,³ the well-known operation of Kocher, and the more or less similar suture operations of Bassini,⁴ Franz,⁵ Fabricius,⁶ Bottini,⁷ and others. What may be termed “flap” operations comprise the osteoperiosteal flaps of Trendelenburg and Kraske,⁸ the musculofascial (pectineal) flaps of Watson Cheyne,⁹ Saltzer,¹⁰ Prokupin,¹¹ and others, and the adductor longus flap of Schwartz.¹² Operations by approach from above include intra-abdominal closure of the ring by laparotomy, and by way of the inguinal region (Ruggi,¹³ Nasi,¹⁴ Parlavecchio,¹⁵ and Tuffier). With these last may be included closure of the femoral canal by the employment of the fascia transversalis (Buonamici),¹⁶ and the method of Lotheissen,¹⁷ or (*vide* Kammerer¹⁸) the Lotheissen-Gordon¹⁹ method, in which the conjoint tendon of the internal oblique and transversalis is attached to Cooper’s ligament.

The following is the technique of the operation I employ:

A. *Obliteration of the sac*, also of the peritoneal depression over the abdominal aspect of the ring, and the substitution of a buttress over the internal aspect of the ring:

1. Expose the sac, and clear it from surrounding tissues (the skin incision may be vertical or transverse).

2. Open the sac longitudinally in its middle line, and clear of contents.

3. Separate it from parts surrounding its neck, including the transversalis and the iliac fasciæ for one inch round the abdominal aspect of the ring.

4. Bisect the sac longitudinally from fundus to neck (Fig. 1).

5. Make an aperture in one half near the neck (Fig. 1).

6. Interlock the halves by putting the other through the aperture (Fig. 2). In certain cases it lies better if previously twisted one half-turn on its longitudinal axis.

7. Reduce the whole sac through the femoral ring into the extraperitoneal space previously cleared for it by detaching its neck from the abdominal aspect of the ring. The sac thus lies bunched up within the abdomen, between the peritoneum and the transversalis and iliac fasciæ over the internal aperture of the femoral canal.

Where the sac is unnecessarily large, part of it may be cut away before reducing it through the canal.

B. Closure of the *Femoral Ring*:

1. Carry an incision (bone-deep) from the femoral vein along the pubic ramus to the region of the pubic spine. This

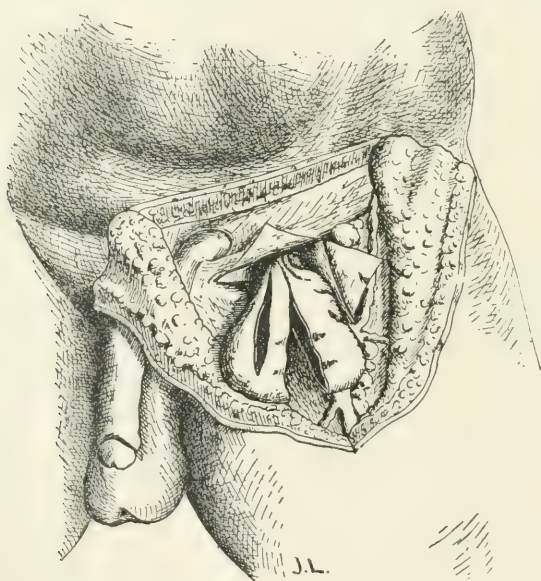


FIG. 1.—Sac emptied, detached from surrounding parts, including internal aspect of abdominal wall for one inch round femoral ring; split longitudinally, and one half incised for passage of the other.

divides the pubic portion of the fascia lata, the origin of the pectineus, and the periosteum. Its length will depend on the extent to which the femoral vein has been displaced outward by the presence of the hernia, and will vary from one inch to one inch and a half.

2. Detach the periosteum to a limited extent, and retract it.

3. Drill the bone near its upper edge in two places one-half inch to one inch apart (one drill-hole may be made to suffice). Any bone drill or punch may be used. In the illustration (Fig. 3), the simple hand drill and the tongue depressor used as a protecting spatula are those I commonly employ.

4. Pass through one of the apertures a loop of stout cat-gut, or other absorbable ligature (Fig. 3). This may be passed by threading it in the eye of a curved surgical needle, or by

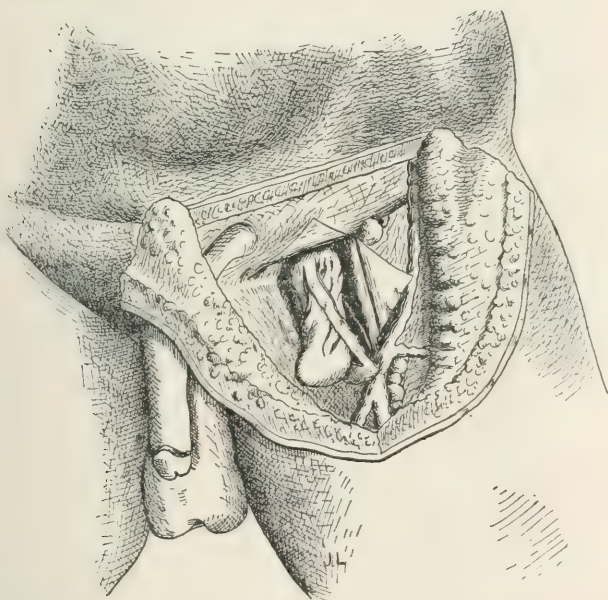


FIG. 2.—Sac ready for reduction, with halves interlocked. (The situation of the aperture in the sac in Figs. 1 and 2, and the relative positions of the two halves of the sac in Fig. 2 are not, in the interests of semidiagrammatic clearness in the drawings, quite those of actual practice.)

pushing it through, simply doubled on itself. It is, however, more easily passed by threading it in the eye of the bone drill or in the eye of an ordinary surgical probe. For the purpose, I employ a special probe in which the eye is small and placed very near the extremity of the handle (Fig. 4). The advantage of that shape and position of the eye will be obvious to

those familiar with drills for wiring fractures, or to any one in his first performance of this operation. With such a probe the operation is of the simplest; without it, some difficulty may be experienced in passing the suture through the aperture. The probe should be of the ordinary pliable type.

5. Divide the loop of ligature. Thread one end in a large curved surgical needle and pass it as a mattress suture through Poupart's ligament. Unthread it from the needle (Fig. 4).

Repeat this with the second end, carrying it through Pou-

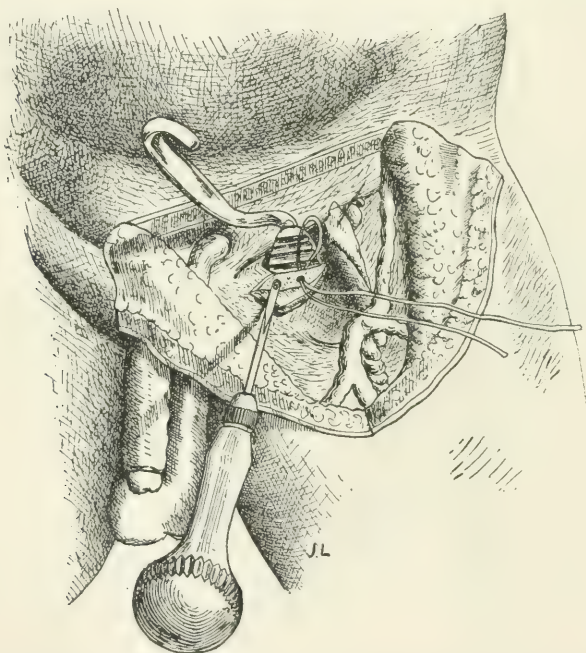


FIG. 3.—Closure of ring; drilling of bone; looped catgut suture passed through first drill-hole.

part's ligament at a higher level (Fig. 4), avoiding the deep epigastric artery to the outer side, and, in male patients, the spermatic cord above. (In very large herniæ, the loops, instead of being placed the one directly above the level of the other, as figured, may be made to diverge in the ligament so as to "gather in" the margin of the aperture.)

6. By means of the probe (into the eye of which the ends

are threaded) withdraw both ligatures through the second drill hole in the bone (Fig. 4). It is in this part of the operation that the special probe is of particular advantage, even if the common device of the loop tractor indicated in Fig. 9 be adopted.

7. Tie the ends of each loop separately over the front of the bone, thus bringing Poupart's ligament down to the posterosuperior surface of the bone and fixing it firmly in contact with that surface, constituting what is in effect an extension

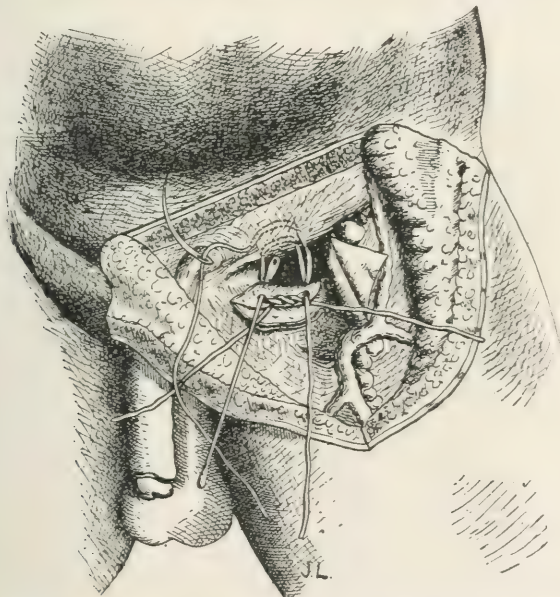


FIG. 4.—Closure of ring; placing of the loops in Poupart's ligament, and return of the ends through second drill-hole. (One loop tied loosely to indicate action in pulling Poupart's ligament down to posterosuperior aspect of ramus of os pubis.)

outward of Gimbernat's ligament, and absolutely closing the femoral ring to whatever extent may be desired, due regard being paid to the amenity of the femoral vein. The degree of occlusion is regulated by the position of the sutures in Poupart's ligament, but not by the tension with which they are tied. This latter does not vary, the knots being tied in all cases firmly to bring the ligament into contact with the bone (Figs. 4 and 5).

8. To make the closure doubly secure, complete the operation by uniting, by interrupted catgut sutures, the detached margin of the pectineal origin and the pubic portion of the fascia lata to the "anchored" Poupart's ligament (Fig. 5).

REMARKS ON THE FOREGOING DESCRIPTION OF THE
FEMORAL OPERATION.

Method of Treating the Sac.—The manœuvre of returning the emptied sac through the canal of a hernia is not new. While descriptions of such operations may be found far back

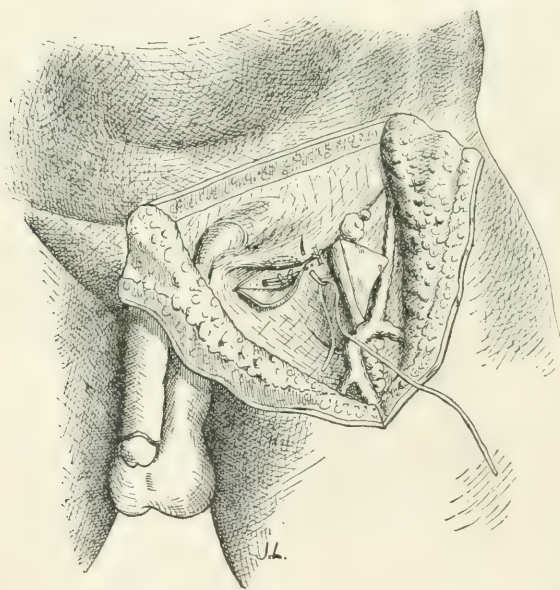


FIG. 5.—Closure of ring; bone sutures tied; completion of closure by suture of fascia lata and pectineus to the fixed Poupart's ligament.

in surgical records, the practice was first put upon a formal footing by Sir William Macewen, and to his advocacy is due the general recognition of the great value of the buttress formed over the abdominal aspect of the ring by the puckered-up sac. Macewen, as is well known, puckers up the sac by a "gathering" suture which, passed through the hernial canal and out through the parietes, is made the means of puckering up the sac on the abdominal aspect of the ring. Variations of

the technique by which Macewen's object is attained have been introduced by other surgeons (*vide*, for example, the operations of Davis²⁰ and Packard,²¹ and the method described above is but one of these variations.

The Absence of All Sutures in the Sac has Three Advantages:

1. The obvious saving of time.
2. Avoidance of the recognized risk of strangulation, and consequent sloughing, of the puckered-up sac in the grasp of the ligature.

3. The facility with which the entire sac may be placed within the abdomen. A suture emerging from the neck of a large sac may, while pulling the neck within the abdomen, by anchoring it to the parietes leave the bulky fundus blocked in the canal. The absence of a suture permits the interlocked sac to be pushed as far within the abdomen as may be desired.

Against these advantages there is to be placed, I believe, one disadvantage, and that a minor one, involved in the absence of suture, namely, that the fixing of the sac in position depends on the tying of the sutures closing the ring, and not upon a special sac suture, and that, therefore, it is necessary, particularly in cases where the patient has "strained" between the placing of the sac and the tying of the ring sutures, to verify and, if need be, adjust the position of the sac before tying the sutures closing the ring. Once tied, these sutures close the ring absolutely, and no prolapse of the sac into the canal is possible. In femoral hernia I have never seen any tendency of the sac to prolapse before closure of the ring, but I have seen it in several cases of inguinal hernia. The explanation may lie in the fact that the inguinal rings are more freely affected by "straining" or deep respiration than is the femoral.

Method of Closure of the Femoral Aperture.—In the first description given of the operation (Glasgow Pathological and Clinical Society, April 14, 1902), I stated that, in looking into the literature of the subject, I found that Roux²² had also been carrying out in the closure of the ring the idea of

attaching Poupart's ligament to the bone, though employing a different method to attain that end, namely, the use of a U-shaped metal nail driven through the ligament into the bone; and that it was somewhat surprising that a further search (so far as the regrettable decease of the invaluable *Index Medicus* permitted such to be made) should have revealed no other references to the utilization of so conveniently placed a *point d'appui* as is offered by the pubic ramus for the closure of the femoral ring on the classic principle of restoring its boundaries to their correct, or to an over-corrected, position.

The method of closing the ring above described, and which I had been practising for some time before I learned of Roux's independent work, is, in my probably too partial opinion, preferable to that adopted by Roux, for the following reasons:

1. Roux's operation involves the introduction of a metal foreign body. The subsequent removal of this, if desired, involves a second operation, with the risk of detaching the ligament from the bone in withdrawing the nail. Its permanent retention, on the other hand, involves the chance of the loosening of the nail by absorption (possibly necrosis) of the bone, as occurs not infrequently with wire sutures in fractures. Should this occur, and the nail become dislodged from the bone by the natural pull of Poupart's ligament or otherwise, a state of matters is established in which every movement of the thigh or abdomen would menace the femoral vessels and the peritoneum with puncture by the points of the nail.

2. The method of suture employed in the operation I have described brings Poupart's ligament down to the posterosuperior surface of the bone, attaching it there in the region of the ileopectineal line on the plane of Gimbernat's ligament, constituting virtually an artificial extension of that ligament. The effect of such an attachment, as a study of the anatomy of the region will show, is to occlude the femoral aperture at its extreme upper (inner) end (the plane of Gimbernat's liga-

ment), thus shutting its mouth, instead of closing its throat as the attachment of Poupart's ligament to the superior or anterosuperior surface of the bone does.

3. By varying the position of the two mattress loops of ligature, or by making them diverge, in Poupart's ligament, it is easy to effectually close the largest femoral ring without exerting pressure on the femoral vein. The tension of the femoral sheath may be regulated with precision.

4. Roux's nail attaches Poupart's ligament to the peri-

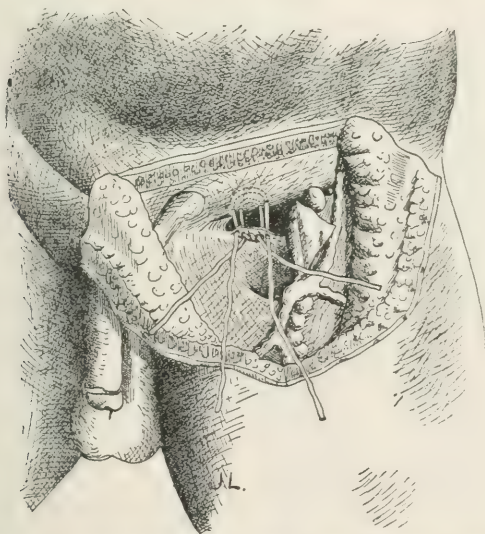


FIG. 6.—Modification of femoral operation. Anterior lip of periosteal incision raised in the form of a short periosteal-fascial flap through which the sutures have been passed.

osteum. The operation above described attaches it independently to both bone and periosteum.

5. The second plane of (musculofascial) sutures affords an additional security in the closure which Roux's operation does not possess.

Modification of Operation.—The following modification is not intended as a regular substitute for the second part of the operation, the closure of the femoral canal. In effect it is less secure. It affords the means, however, of attaching

Poupart's ligament in the desired position in cases where the operator is not supplied with a drill, as when hurriedly called to operate in a case of strangulation.

The sac having been reduced into the abdomen, and Poupart's ligament pushed back with a spatula, an incision is carried along the posterosuperior aspect of the pubic ramus from the femoral vein to the pubic spine (or part of that distance). This divides the periosteum. Its anterior lip is then raised to a slight extent by any convenient elevator, such as

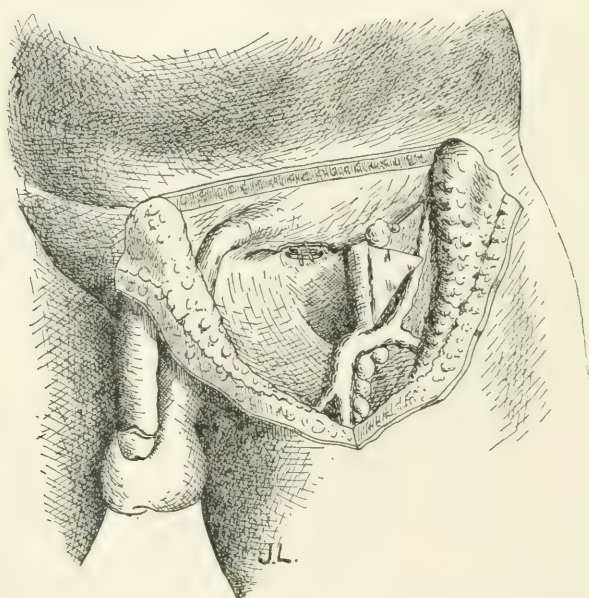


FIG. 7.—Modification of femoral operation. Suture knots tied on anterior (outer) aspect of anterior lip of periosteal incision, thus lodging the free margin of Poupart's ligament in the periosteal incision.

N. B.—In Figs. 6 and 7 the periosteal lip or flap is necessarily represented as raised too extensively, and, therefore, too long.

the flat end of an ordinary probe bent to a suitable angle or the blade of a pair of curved scissors. The effect of this is to form a short periosteofascial flap, the size of which has, for the purposes of illustration, been exaggerated in Fig. 6.

With an ordinary curved surgical needle the catgut suture is carried through Poupart's ligament, divided, and the ends,

again threaded in the needle, successively passed into the periosteal incision and out again through its anterior lip (Fig. 6). The tying of these ends lodges the free margin of Poupart's ligament in the periosteal incision on the posterosuperior aspect of the bone, thus closing the canal (Fig. 7).

As already mentioned, the closure thus obtained is less secure than that resulting from the bone suture method. Further, if the periosteal incision be made too long, or the anterior lip be raised as far as it, necessarily, has been in the illustrations, the result will be the attachment of Poupart's ligament, not to the posterosuperior, but to the superior surface of the bone, a much less efficient attachment.

Inguinal Hernia.—As applied to inguinal hernia, the method, as stated above, has in cases of ordinary severity probably no advantages over any of the many other methods in use. In severe cases, however, the combination of internal buttress, bone sutures, and superimposed musculofascial sutures involved in the method secures a closure of the aperture more absolute than can *in such cases* be secured by probably any other method. For it must be recollected that in practically all the known methods of operating for inguinal hernia, the *point d'appui*, whether the sutures are carried through the structure itself, or through other structures attached to it, is Poupart's ligament. The old, large, "severe" inguinal hernia rests on a Poupart's ligament which has stretched into a thin lax band sagging loose in a downward curve between its points of support at pubic crest and iliac spine. What in its normal condition constitutes an efficient fixed support on which the closure of the canal may be securely made, becomes, when stretched in an old severe hernia, considerably less efficient for the purpose. One of the main ideas concerned in the application of this method to inguinal hernia is to reinforce in such cases the defective Poupart's ligament by the backing of the pubic ramus.

The technique of the operation in inguinal hernia is as follows:

A. *Obliteration of Sac, and Formation of Intra-abdomi-*

nal buttress.—The treatment and final bestowal of the sac are carried out as in femoral hernia, and the terms of the description given in that case may, *mutatis mutandis*, be applied to inguinal hernia (Fig. 8), the sac being lodged over the internal aspect of the internal inguinal ring as a pad resting between the parietal peritoneum, on the one hand, and the fascia transversalis on the other.

B. *Closure of the Inguinal Canal:*

1. With blunt retractors pull the spermatic cord (or round

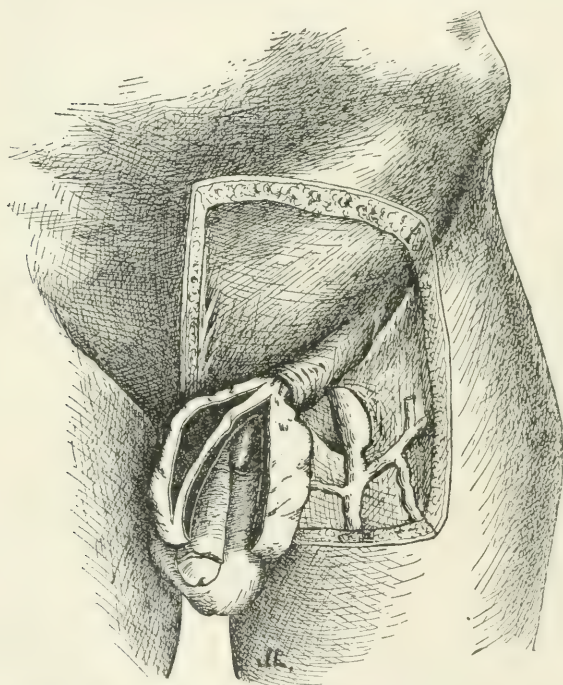


FIG. 8.—Sac emptied, detached from surroundings, bisected, and incised for interlocking and reduction.

ligament) upward and Poupart's ligament downward. The lax condition of the latter in cases of severe hernia permits free retraction, affording space not indicated in a dissection of the normal region.

2. Carry an incision along the superior aspect of the pubic ramus. This divides the iliac fascia, the origin of the

pectineus, and the periosteum. Its limits are the pubic spine and of the femoral sheath.

3. Slightly detach both margins of the periosteal wound.

4. Drill the bone, near its upper margin, in two places, one-half to one inch apart. The drill-holes are situated somewhere between the pubic spine and the femoral sheath, their exact position varying with the shape and size of the hernial aperture. The drill may be applied to the bone above the level

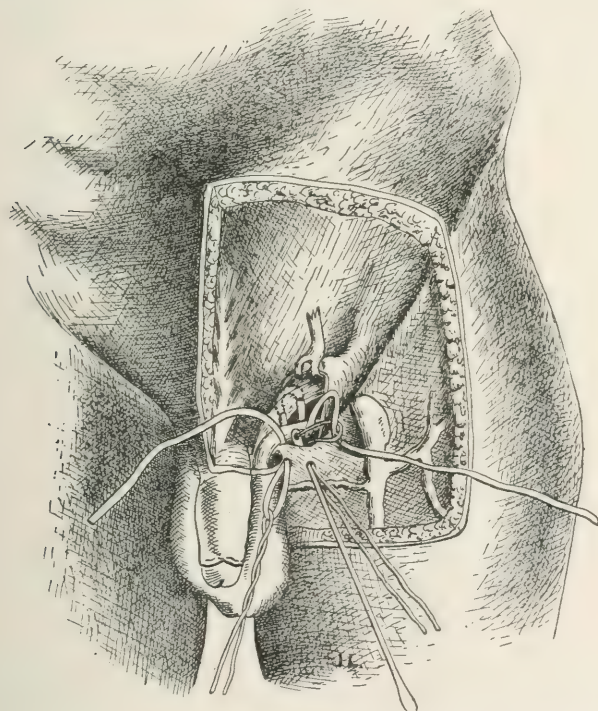


FIG. 9.—Closure of canal; bone drilled; mattress suture placed in internal pillar, and withdrawn through drill-holes by probe and loop-tractor.

of the retracted Poupart's ligament, in cases in which that is sufficiently lax to afford the necessary room for passing the drill *transversely* through the bone. In cases in which that is not so the drill should be applied to the anterior surface of the bone below the level of Poupart's ligament, and, in consequence, after perforating the pubic portion of the fascia lata.

Transverse perforation of the bone is essential. Oblique perforation places the internal apertures of the drill-holes far down on the posterior aspect of the bone, and more or less inaccessible. (*Vide*, also the position of the ligature knots, as described below.)

5. Pass a stout absorbable ligature, in the form of a large mattress suture, through the internal pillar of the hernial aperture. It is essential that this should have a "good bite" of the conjoined tendon and of the fascia transversalis (Fig. 9). It may or may not include the external oblique. During

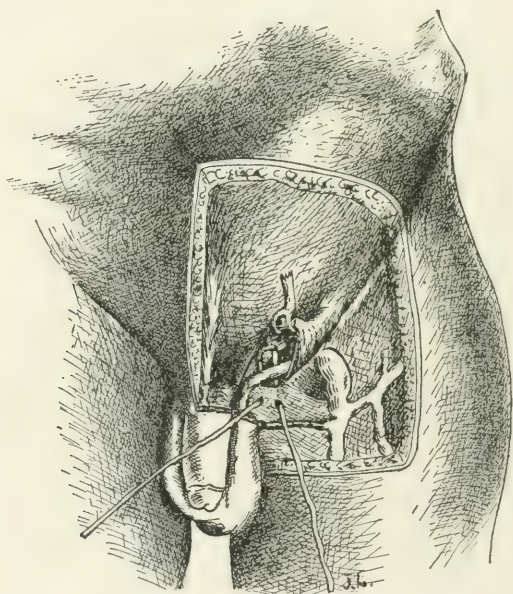


FIG. 10.—Closure of canal; suture, traversing internal pillar, and drill-holes in bone, ready for tying. The suture, here represented single, is commonly used double, each loop being tied separately.

the placing of the suture, the peritoneum is protected by the finger passed through the canal into the extraperitoneal fat behind the internal pillar. While indicated in the illustrations as single, the ligature should be double (*vide* Figs. 3 and 4), the loops being placed one above the other.

6. Pass the ends of the sutures out through the holes drilled in the bone. Of various methods of doing this, the

most expeditious are either the special probe indicated or the loop tractor (Fig. 9).

The sutures may pass in front of the spermatic cord or behind it (Fig. 10), as may seem best to secure firm closure of the canal without undue compression of the cord. In the event, the cord will occupy in the former procedure the position of the direct inguinal hernia, in the latter that of the oblique variety.

7. Tie the ends of the two loops of ligature separately.

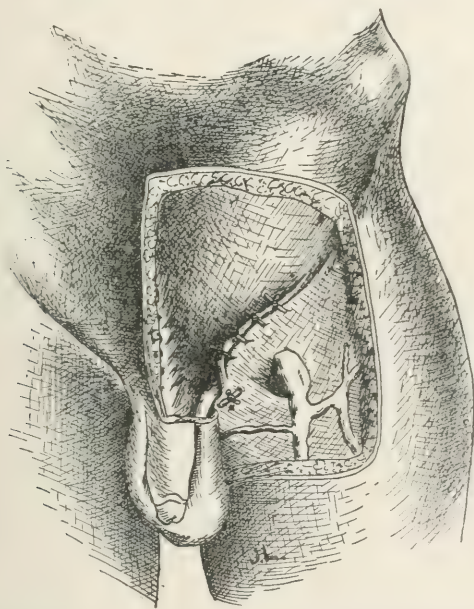


FIG. 11.—Closure of canal. Poupart's ligament sutured to the internal inguinal pillar.

The tightening of the knots brings the internal pillar down into the periosteal incision and lodges it firmly against the bone.

The position of the knots may vary. In Figs. 9 and 10 the ends of the suture, after having been passed out through the drill-holes in the bone, have been carried from within outward through the pubic portion of the fascia lata below the level of Poupart's ligament, and (Fig. 11, x) tied there, on

the external surface of the fascia. Or the suture ends, after traversing the bone, may be tied above the level of Poupart's ligament (Fig. 12), the knots lying between Poupart's ligament and the bone, or even between the periosteum and the bone, though the latter position is not free from objection on account of the risk of interfering unnecessarily with the vitality of the bone. The same choice of position, above or below Poupart's ligament, applies to the direction of the drill in making the perforations in the bone (which see). The factor in the choice of the position of both drill and ligature knots is the degree of relaxation which has occurred in Poupart's ligament.

The knots should in all cases be tied firmly to lodge the internal pillar against the bone. Here the amenity of the spermatic cord is efficiently protected, as is that of the femoral vein in the femoral operation, by adjusting the position and size of the loops of suture in the internal pillar, and not by varying the tension of the knots. Should threatened compression of cord (or vein) necessitate the "replacing" of the loops, time may be saved by dividing each loop above the bone and retaining the ends as tractors for the passage of the new sutures.

8. Complete the operation by lifting the lax Poupart's ligament to the anterior surface of the internal pillar, and fixing it there by interrupted sutures which should be of stout catgut, or other absorbable material, and should penetrate at least the external and internal oblique muscles. This final step in the operation is, obviously, one made possible solely by the lax condition of Poupart's ligament. It is difficult in small herniæ, impossible in the normal cadaver, and not easy to depict by pencil, however skilled (Fig. 11).

Modification of Operation.—As in femoral hernia, the method may be modified in cases where the operator finds himself unprovided with a drill. The anterior lip of the periosteal incision is a stout structure, comprising, in addition to the periosteum, the iliac fascia and the origin of the pectineus. This lip is to be slightly raised, and the ends of the suture

carried through it from within outward (Fig. 12) and tied there. The knot may lie above or below the level of Poupart's ligament (see remarks above). The operation is finished by suturing Poupart's ligament to the anterior surface of the internal pillar as described above (Fig. 11). The closure obtained by the modified operation is less secure than where bone suture is employed, but has been found efficient.

Remarks on the Foregoing Description of the Inguinal Operation.—It may be well to disarm criticism by repeating

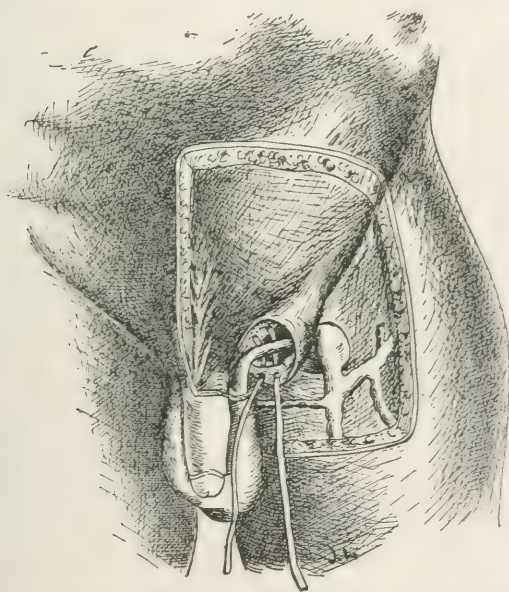


FIG. 12.—Modification of inguinal operation. Anterior lip of periosteal incision raised in the form of a short periosteofascial flap through which the sutures have been passed.

that this method of operating appears to have less *raison d'être* in inguinal than in femoral hernia, and has been employed for "severe" cases only. Further, it is to be noted that the method involves three distinct procedures in combination, and that the modification above described in the second procedure (the use of the anterior lip of the periosteal incision) comes near to trenching on known ground, while the third procedure (the suturing of Poupart's ligament to the internal pillar) is com-

mon to the majority of recognized operations for the radical cure of inguinal hernia.

To the skill and kindness of Dr. John Lindsay, of Glasgow, I am indebted for the sketches which form the illustrations.

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THE RADICAL OPERATION FOR INGUINAL HERNIA.

A METHOD FOR CLOSING ALL LAYERS WITH A SINGLE TIER
OF EASILY REMOVABLE NON-BURIED SUTURES.

BY JOSEPH RILUS EASTMAN, M.D.,
OF INDIANAPOLIS, INDIANA.

IN most cases of recurrence after radical operation for hernia it will be found that faulty asepsis is responsible for the accident. This is shown by the circumstance that since rubber gloves have come into general use the percentage of recurrence has been lowered in the experience of practically every surgeon who has made a considerable number of such operations. No matter what the method, if the sac be amputated high enough, hernia will not often recur provided the operative technique be aseptic. Very often the chain of asepsis is broken by the introduction of non-asepticizable absorbable sutures. An absorbable suture is never more than relatively aseptic, which means practically that it is not aseptic at all. On the other hand, the burying of non-absorbable sutures is attended with some danger, and few operators are willing to bury non-absorbable material in operating for inguinal hernia.

Upon the accompanying cut is represented a method for introducing a single tier of non-absorbable sutures which sutures coapt all the layers either according to Ferguson's so-called anatomic method or according to Bassini's. These sutures may be easily removed after firm union has taken place. So far as the possibility of its introduction is concerned, any sort of non-absorbable suture material may be used in this way. In eleven cases thus operated the writer has used heavy Pagenstecher celloidin linen. The manner of introduction of the sutures is simple. The time required for operating, all things being equal, is less than that required for the execution of the classical radical operations.

After incision down to the aponeurosis of the external oblique, exposing both rings, the overlying superficial tissues should be wiped with gauze from the aponeurotic layer to such an extent that Poupart's ligament may be freely exposed. After reduction of its contents, the sac should be twisted upon itself as practised by C. H. Mayo, so that all the slack of the peritoneum about the neck of the sac may be taken up before the transfixing suture is introduced.

The Pagenstecher linen suture bearing a needle upon each end is first passed through Poupart's ligament from without inward one inch from its free margin. It is then passed through the outer border of the obliquis internus and transversalis muscles and brought back through Poupart's ligament about one-third of an inch nearer the margin of this ligament than its first point of passage. The needle now external to and above Poupart's ligament is made to overlap the free margins of Poupart's ligament and the aponeurosis of the external oblique by carrying the linen through in the form of a simple running mattress suture. The needle is next passed through the superficial fascia, panniculus adiposus, and skin emerging about one-eighth of an inch from the skin wound margin upon the side opposite Poupart's ligament. The needle upon the tail end of the suture is brought up through the subcutaneous fat and skin upon the side of Poupart's ligament. When traction is made upon the two ends of the suture, no kinks or curls remain, and the suture is tied up as a simple loop and, being clipped, may be drawn out with the slightest traction.

In almost all cases it will be found easy to execute Ferguson's operation in this way; five or six sutures sufficing to coapt the layers anatomically from the internal ring to the pubic bone. Pursuant to Coley's suggestion relative to the Bassini operation, the writer has always introduced one of these sutures above the internal ring to reinforce this weak point.

In the radical operation for inguinal hernia in children, the method here described will be found applicable in practically every case, where, as Czerny has contended, the more

or less complicated classical methods of operating are quite unnecessary. In small herniæ of adults, the simple tier method is applicable. In very large herniæ with wide separation of the conjoined tendon and Poupart's ligament this suture will for obvious reasons not be efficient.

It should be understood that nothing whatever is claimed for the method except that all the layers may be readily and securely coapted in this manner in nearly all cases of hernia. As to the ultimate results, nothing is claimed, since the writer's operations have all been made within the year. There is, however, no apparent reason why the permanent results should not be good.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 25, 1905.

The President, HOWARD LILIENTHAL, M.D., in the Chair.

OPERATIVE TREATMENT OF CLEFT PALATE.

DR. CHARLES H. PECK read a paper with the above title (for which see page 5).

DR. H. LILIENTHAL presented a girl, eight years old, who at the age of three years was operated on by him for an enormous cleft involving both the hard and soft palates. The operation done was practically similar to that described by Dr. Peck, excepting that no tissue was cut away and that no obturator was used, as that device to assist in the protection and healing of the wound was at that time unknown to him.

The operation proved a complete failure, and it was decided not to resort to any further operative interference until the child was at least three years older. About that time he learned that by treating this condition with a skilfully made obturator the functional result was often better than could be obtained by surgery. He thereupon referred the patient to Dr. R. Ottolengui, of this city, who devised an obturator for her to wear. She was the youngest patient who had ever been fitted with such an appliance, and her condition at the time was very poor. She had a severe nasal catarrh, her voice was discordant and exceedingly disagreeable, and she was totally unable to make herself understood.

She had now worn the obturator about two years. Her general condition had greatly improved; her catarrh had disappeared, and while the result was still far from perfect, both her speech and the quality of her voice were vastly better. She was beginning to talk fairly well and was attending school.

DR. CHARLES N. DOWD said that one of the interesting questions that arose in the discussion of this general subject was whether to operate upon very young children? Dr. Brophy, of Chicago, had operated on a large number of patients under six months of age, and his results were favorable. He used lead plates, which supported the palate on each side, and he omitted the lateral incision. Dr. Dowd said he had done this operation three or four times, and had found the plates of real service in the younger class of children. He did not think it was practicable, in those patients, to use an obturator.

DR. ELLSWORTH ELIOT, JR., said that in every case of cleft palate where there was a reasonable hope of success, he thought an operation should be undertaken. Even if the operation proved unsuccessful, he understood that it did not interfere with the subsequent application of a mechanical appliance.

As regards the age at which operative interference should be recommended, the speaker thought it should not be done too early, when the parts were very small, nor too late, and before any marked defects of speech had been acquired. Personally, he preferred to operate at the age of four or five years. In the case of a young man of sixteen upon whom he had done Ferguson's operation, the soft palate was not only closed but there was also great improvement in articulation. He recalled other cases in adults where the operation had also given satisfactory results. In Brophy's operation, with which he had personally had no experience, the two superior maxillæ were forcibly approximated.

DR. GEORGE WOOLSEY said that in the treatment of these cases he had tried both operation and the use of an obturator. The choice of the method largely rested with the child's parents. Many people did not like the idea of their children wearing an artificial appliance in the mouth. Another objection to that method was that it could not be satisfactorily employed until after the eruption of the six-year molars, which is often delayed. Personally, he was in favor of operating in almost every case where there was a fair chance of approximating the edges of the cleft. In cases with a very wide cleft, Dr. Ochsner, of Chicago, had recommended an apparently feasible method of chiselling up between the alveolar processes and the bony palate, and then plugging this gap after forcing the bony palate inward towards the cleft. Dr. Woolsey said that in the single case where he had

resorted to this method he was unable to state the final outcome of the operation, as the patient had been lost sight of. The Brophy operation, in infancy, could only be done when the bony parts were so pliable that the lateral halves of the maxillæ could be forcibly approximated,—*i.e.*, in the first three months of infancy. He had only operated on one such case.

DR. DOWD said that Brophy had described two distinct operations; one, in dealing with cases of complete cleft palate through the alveolar process, in which he brought the two sections forcibly together, while in the other, where the cleft was not complete, he utilized the lead plates. Dr. Dowd said that about a year ago he showed the result of an operation in a child of three months where the parts came together pretty well. In that case the cleft had gone entirely through the alveolar portion of the jaw. Since that time, at a second operation, he had brought the parts still further together, so that the result was very good. In that instance it was necessary to use considerable force, and also to make an incision in the jaw above the alveolar process so as to further free the parts.

DR. PECK said he had been unable to determine from Brophy's writings whether or not he attempted to secure complete closure of the soft and hard palates at a single sitting. The important feature in these operations was to secure closure of the soft palate as early as possible, so that the parts might develop with the growth of the child.

As regarded the mortality of the operation, Dr. Peck said, an English surgeon had collected eleven cases, with five deaths, Brophy had reported over three hundred cases, with a death rate of three per cent. He had also reported over nine hundred operations upon the palate, but the exact extent of the lesion was not given nor the immediate nor ultimate result. He had not seen nor heard of any case operated upon in this city where the Brophy operation had resulted in a complete closure.

DR. DOWD said he thought that in the Brophy operation for incomplete cleft, immediate closure of both the hard and soft palates was aimed at. In the other operation, when the cleft extended through the alveolar process and the bones had to be forcibly brought together, complete closure usually was not attempted at one sitting. However, it could be done at a subsequent operation. One feature that should not be lost sight of

in these operations was the possible shortening of the short palate, and in order to prevent that, it was of great importance to secure closure of the hard palate, so as to obviate traction. In 1901 Brophy had reported over two hundred operations in infants under six months of age without any mortality. He had a mortality in those over that age.

DR. LILIENTHAL said that, in choosing between operation and prosthesis, the determining factor should be the question of mortality. A mechanical appliance, as had been demonstrated in the case shown, gave a pretty good functional result—as good, if not better than any he had seen accomplished by pure surgery. He recalled a case of congenital cleft palate where the effect of the application of an obturator by Dr. Ottolengui was such that no defect was perceptible in the patient's speech. It was so perfect, in fact, that he passed the surgeon's examination during the war with Spain, and his disability was not discovered until he contracted typhoid fever.

In a case of congenital cleft palate where the child was unable to be fed, Dr. Lilienthal thought that Brophy's operation should be promptly tried, and, if possible, done before the infant was ten days old. In those cases something had to be done without delay. In cases where the operation was not urgent, lives would undoubtedly be saved by not operating. There was a distinct mortality connected with the operation, and in the speaker's experience, a pretty high one, probably not less than ten per cent. This question of mortality should be squarely put before the parents.

As to the operation itself, the speaker said the operator would do well to take advantage of the suggestion made by the elder Warren and dip his silk sutures into the compound tincture of benzoin, which would make the knotting easier.

DR. R. OTTOLENGUI said he did not agree with the statement made by Dr. Eliot that, even if an operation proved unsuccessful in these cases, it did not interfere with the subsequent application of a mechanical appliance. When these patients are allowed to remain as they were originally, they present certain conditions which have been studied and can be remedied, but after they have been subjected to a surgical operation which proves a failure, they present unique conditions, each of which necessitates special study and a special apparatus.

Such cases are much more difficult to treat by means of an obturator than if they had been left alone.

The speaker said he was well acquainted with the work of Dr. Brophy, and he knew of one instance where that operator had secured a fine result in articulation, and that was in an infant. It took some eight or ten years to discover whether these operations were successful or not, on account of the possibility that the palate would fail to lengthen along the cicatricial line. For that reason he thought that, if an operation was decided on, it had better be postponed until adult life, so that the growth of the palate would not be interfered with. He had never yet seen a case operated on in early life where the growth of the soft palate had not been interfered with. In dealing with a cleft of the hard palate this objection was of less importance, as there was more tissue to be utilized.

He laid special stress upon a case of a girl operated on, by his advice, at the age of four. The operation proved quite as successful as those shown at this time, and with instruction the girl learned to talk well. At the age of twelve, however, the growth of the palate, everywhere except along the cicatrix, practically produced a cleft palate, and an obturator became needful.

In one instance of cleft palate in a girl, he had fitted her with an obturator when she was eleven years old. She had since married, and her husband had never discovered the fact that she had a cleft palate.

He had seen complete immediate closure of the hard and soft palate in an operation done by Dr. Brophy. When one succeeded in closing the hard palate, the remainder of the operation could be done subsequently, or it could be done at a single sitting. That depended on the condition of the patient and the wish of the operator.

DR. PECK said he thought that closure of the hard palate was most easily accomplished by the flap operation, although he had never attempted this method in young children, and he believed that it would be increasingly dangerous in patients under two or two and a half years old. Personally, he preferred to do the operation on children after they had reached the age of six or seven years.

In regard to the final improvement in speech he was unable to make any definite statements, as all of his cases were compara-

tively recent. In some of them, however, there had been a remarkable improvement in the speech. He had operated on eight cases during the past eighteen months, two of the patients being adults, aged, respectively, nineteen and twenty-one years. In the first of these two, there was complete healing, with the exception of one small area, which broke down and healed by granulation in a few weeks. In the other case there was a complete cleft extending forward through the alveolar process, and complete closure was not attempted at the primary operation, the anterior end being left for a future sitting. In that instance complete closure of the sutured part was obtained, but the patient had failed to return for the secondary operation. In both of these cases the improvement in speech had been slight when they were last seen. As a suture material in all of his cases, Dr. Peck said he had used plain silk. An important point in the technique was to secure accurate apposition of the parts. In the after-treatment he had commenced feeding early and had never resorted to rectal alimentation. He had had no mortality, nor had he seen any alarming symptoms follow the operation. He believed it was possible to get complete healing of both the hard and soft palates in almost every case. In perhaps 50 per cent. of the cases a slight secondary operation might become necessary.

CONGENITAL PYLORIC STENOSIS.

DR. JOHN ROGERS presented an infant, born on April 1, 1905. It weighed ten pounds at birth, and it was noted at the time that it had a right inguinal hernia. The infant was breast-fed from the outset, but "spat-up" a good deal of the milk. On May 25, it first began to vomit constantly soon after every nursing, and this continued and grew worse in spite of lavage, the use of various kinds of artificial foods, etc. By the 28th of June the child had become extremely emaciated, and a visible peristaltic wave of the stomach was noticed for the first time. There was no tumor: constipation was quite marked: only a slight discoloration was obtained in the water after an enema; the vomiting was not of an expulsive character. It was also observed at this time that after one or two attacks of vomiting, the stomach would, on washing, be found to contain, almost intact, the food taken six hours previously. Once the mother noticed that the vomitus was much more than the last feeding.

The diagnosis of congenital pyloric stenosis was made, and the child was operated on June 30. At that time it was three months old, and weighed seven and one-half pounds. The abdomen was opened through a median incision and a simple posterior gastro-enterostomy done by suture according to the Czerny-Peterson method, without any loop. The original intention had been to effect the anastomosis by means of a Murphy button, and Dr. Willy Meyer had loaned him an extremely small button (about one-half the size of the smallest normal Murphy button), which had been especially constructed with such a case in view, but even this small-sized button was found to be entirely too large, and the parts were sutured. The pylorus was found to be about the size of the end of an adult thumb, very hard, and lying well up under the liver, so that it would have been impossible to palpate it. Dilatation would have been impossible, as would also, probably, pyloroplasty.

On the day after the operation, the patient's temperature rose to 103° F.; pulse, 160, and the vomiting still continued. On the following day these symptoms had disappeared, and from that time on the child made an uneventful recovery and had gained rapidly in weight and strength.

DR. WILLY MEYER said that about five years ago he was called upon to operate on two cases of congenital pyloric stenosis. The first was that of an eight weeks baby, very much emaciated. A posterior gastro-enterostomy was done with the smallest-sized Murphy button then in the market (cholecystenterostomy), which fitted very closely. The patient did very well for the first two days; then vomiting recurred and the child died. At the autopsy, a mechanical obstruction of the small intestine, due to the button, was found.

In his second case, which was operated on about six weeks later, he employed the suture instead of the button. That case also resulted fatally. In any future case of this kind upon which he might be called upon to operate, Dr. Meyer said he would always resort to suture in preference to the button, and would insist on having the patient removed to the hospital. Both of his operations were done at the patients' homes. For cases of emergency he now possessed "baby buttons," with a diameter of four-eighths and five-eighths of an inch. They are manufactured by Tiemann & Co. The case of the first child thus

operated on was published by Dr. S. F. Meltzer in the *Medical Review*. The specimen is in the Pathological Museum of the College of Physicians and Surgeons.

ACUTE PANCREATITIS; CHOLELITHIASIS.

DR. HOWARD LILIENTHAL presented a woman, twenty-two years old, who three weeks before her admission to The Mount Sinai Hospital, and six weeks after the birth of her first child, had an attack of epigastric pain and vomiting, which subsided in a few hours. Since then she had felt well until the day prior to her admission, when she was seized with a sharp, lancinating pain in the right hypochondrium, radiating downward. She had vomited twice, once bile-stained. The bowels were normal; there was no jaundice. Subsequently the pain radiated over the entire abdomen, but was most marked in the epigastric and right hypochondriac regions.

On admission, May 26, 1905, the abdomen was markedly distended and rigid, so that deep palpation was impossible. There was marked tenderness in the epigastrium, as well as in both iliac fossæ. Vaginal and rectal examinations were negative. Under anæsthesia a mass was palpable in the epigastrium. The patient's temperature was 101.8°; pulse, 120; respiration, 28. The impression made was that of an individual suffering from perforation of one of the viscera, with peritonitis. The easily palpable epigastric mass led to the belief that the case was one of perforated gastric ulcer with considerable effused lymph, and probably adhesions with neighboring viscera.

Operation.—May 28. When the peritoneum was opened through a median incision above the umbilicus, bloody fluid escaped. The fat of the omentum and parietal peritoneum showed many areas of necrosis, and, to a lesser extent, the subcutaneous fat. The pancreas was enlarged and hard, especially the head. After closing the median wound an incision was made through the right rectus in order to reach the gall-bladder. Aspiration of the pancreas through this opening was negative. The peritoneum of the gall-bladder was sewn to the parietal peritoneum, and a purse-string suture passed about the fundus of the gall-bladder. On incision, much bile-stained mucus escaped, and many small granular stones, as well as two larger (pea-sized)

ones. A tube was inserted into the gall-bladder for drainage, and gauze packed about the visceral opening.

The post-operative progress of the patient was uneventful. There were occasional complaints of sharp pains in the abdomen, and the temperature during the first week ranged between 100° and 102° F.; the pulse, between 85 and 110. There was a copious discharge of bile for the first two weeks. The patient was discharged cured on June 27, with a small superficial sinus.

Microscopical examination of the omental fat removed at the time of operation showed fat necrosis. The material draining from the gall-bladder was examined by the physiological chemist of the hospital, for trypsin, steapsin and pancreatic rennet, with negative results. Examination of the stools was negative for blood; positive for bile and free fat.

When this patient was examined on October 22, 1905, she appeared to be in normal health. The abdomen was somewhat distended by gas in the intestines, but there were no symptoms of disturbed digestion. The cicatrix was small and firm.

DR. JOHN F. ERDMAN said he had recently operated on two cases of acute hæmorrhagic pancreatitis. The first, on the tenth day of disease, which resulted fatally, was not recognized until the autopsy, when two very small calculi were found in the pancreatic duct. They were soft, and apparently gall-stones. At the time of the operation, two hundred and twenty stones had been removed from the gall-bladder. The second operation was done eleven hours after the onset of the pain, two weeks ago, and the patient was apparently on the road to recovery.

DR. LILIENTHAL, in speaking of cholecystotomy in dealing with acute pancreatitis, said that unless the pancreatic fluid was found there upon examination, he did not see how the mere drainage of the gall-bladder did any special good, excepting possibly in those rare cases where immediate relief was afforded by removing a stone from the common duct. He thought it was the puncture of the pancreas that proved beneficial in those cases, and not the cholecystotomy.

DR. WOOLSEY said that he did not think it necessary to puncture the pancreas. He had had three cases that recovered without puncturing the pancreas, limiting himself to opening and washing out the peritoneal cavity. In all of them there was profound collapse. He had expected to do a secondary

operation, but it proved unnecessary. He had not touched the gall-bladder as the time required could not be given owing to the collapsed condition of the patients.

DR. LILIENTHAL said that in two out of three cases upon which he had operated he did not wash out the peritoneal cavity, and both cases got well.

END TO END ANASTOMOSIS FOR CARCINOMA OF THE SPLENIC FLEXURE.

DR. LILIENTHAL presented a woman twenty-two years old, who, when she came under his observation, early last June, complained of vague pains in the left hypochondriac region, and palpation in that region revealed a fairly hard mass, about the size of an adult fist. The patient gave no intestinal symptoms. The urine was negative, and blood examinations failed to give any clue as to the nature of the trouble. She stated that at the onset of her trouble, she had had occasionally attacks of abdominal cramps. Her general health had deteriorated considerably. The tumor felt like a large movable kidney.

An exploratory operation was decided on, and the left kidney was exposed, and proved to be normal in size and position. The growth that had been felt proved to be a carcinoma of the splenic flexure of the colon. There were a number of firm adhesions to the stomach which had to be removed by ligation. The involved section of the gut was then removed, and an end-to-end anastomosis effected by suture.

There was slight intestinal leakage for a few days after the operation, but this was at no time alarming. The result of the operation was very satisfactory, and the patient is now enjoying excellent health, and has gained considerably in weight.

DR. LILIENTHAL said the incision he had employed in this operation was the one commonly resorted to in exploring the kidney, and while it was unusual in a case of this kind, it gave excellent access to the tumor, and the subsequent drainage was perfect. In this connection, he stated that Dr. Moschowitz had just called his attention to a reference by Alfred Neumann in a recent number of *Langenbeck's Archives* giving the report of a case of resection of the colon through the usual incision made for exposure of the kidney.

A microscopical examination of the growth in this case, Dr.

Lilienthal said, was made by Dr. Libman and proved it to be an adeno-carcinoma.

RESECTION OF RECTUM FOR SYPHILITIC STRICTURE,
WITH END TO END ANASTOMOSIS.

DR. JOHN A. HARTWELL presented a negress, thirty-eight years old, who was admitted to the Lincoln Hospital about the middle of March, 1905. She gave no past history of syphilis. Five years before she had been operated on at a New York hospital for a fistula-in-ano which had never healed up. Examination showed a tumor of the rectum, situated about two and a half inches from the margin of the anus. It was hard and firm, and could be distinctly felt through the vagina. The tumor surrounded the gut, the calibre of which was just large enough to admit the tip of the finger, and the upper margin could not be felt. Upon examination it proved to be a simple chronic inflammation, without any evidence of new growth. A diagnosis of syphilitic stricture of the rectum was made, and the patient was advised to submit to a colostomy, but she refused.

On March 28, 1905, with the patient in an exaggerated knee-chest position, a median incision was made from the fifth sacral vertebra down over the coccyx to the anus. The anal opening was then closed with a purse-string suture, and the rectum entirely freed from its bed for a distance of about six or seven inches from a point two inches above the anus. Two clamps were then applied above the tumor and the section made between them with the actual cautery. After dissecting out the mass, the gut was divided between clamps just below the tumor and the distal end of the upper segment of the gut was brought out through the anus, and sutured to the skin. The sphincters were not incised.

About five days after the operation, sloughing of the tissues along the line of suture occurred, resulting in an open space of about one inch between the upper and the lower segments of the gut. A vaginal sinus occurred, and the bowels moved both into the vagina and into the posterior opening. The vaginal sinus closed within two months, and in June, 1905, about three months after the operation, the patient had a normal passage that would admit the largest bougie without any difficulty. She

then went into the country and neglected to keep the passage dilated, and three weeks ago, when she was admitted to Bellevue Hospital, a stricture had re-formed which was so tight that it would scarcely admit the index finger. This was dilated under anæsthesia, and the patient now had a fairly normal passage.

DR. F. KAMMERER said that his experience with resection of the rectum for stricture had not been very encouraging although no deaths had followed operative interference. In a number of such operations that he had done the stricture had recurred. The operation itself is generally a much more difficult procedure than a resection for carcinoma, owing to the extended cicatricial contraction in the perirectal spaces. Of course, in these cases, as well as in operation for cancer, an artificial anus should always be established. There can be no question that one does occasionally get complete union of the resected ends of the bowel without preliminary colostomy, but these instances in the speaker's experience, are rare, as the sutures generally give way at the posterior circumference, resulting in a sacral fecal fistula above the anus, which is very difficult to close. For cancer of the rectum resections had the further disadvantage of forming recurrences. The speaker said he was well aware that cancer of the rectum, under equal conditions, was less likely to recur after removal than cancer of other organs, but it had been his experience that, when it did recur, it was generally in the line of suture after a resection. The speaker, therefore, believed that resection of the rectum would be viewed in a less favorable light than it had been by surgeons some eight or ten years ago.

DR. WILLY MEYER said that Kraske had recently reported quite a series of cases where the result of resection of the rectum for cancer had been most excellent, and he had again highly recommended the operation.

DR. HARTWELL, in closing, said he agreed entirely with Dr. Kammerer, and in a paper which he had read before the Society last spring, he had made the statement that a colostomy should always be done before attempting a resection for either stricture or carcinoma. In the case he had just reported the patient had absolutely refused a colostomy. He was not hopeful that the stricture would not recur as extensively as before the operation though at the present time it was of soft tissue and could be easily dilated.

RESECTION OF THE COLON.

DR. OTTO G. T. KILIANI presented a specimen removed from a woman, twenty-five years old, who was admitted to the German Hospital on June 12, 1905. She stated that six weeks before admission she had begun to suffer from discomfort and colicky pains in the epigastric and right hypochondriac regions, and that at certain times a tumor appeared and disappeared in the middle of the abdomen. This tumor was hard, but not tender. She also complained of vomiting after meals, loss of appetite and weight, and chronic constipation. For five weeks she had been an inmate of another hospital, where she was treated for a possible ulcer of the stomach.

When Dr. Kiliani examined her, there was slight resistance in the epigastric region, which he thought was possibly due to a carcinoma of the colon. Upon opening the abdomen, he found a tumor, which proved to be a carcinoma of the colon, and in order to remove it twelve centimeters of the gut were resected.

The patient has gone back to Switzerland and is, according to a letter received two weeks ago, entirely well so far.

RESECTION OF INTESTINE FOLLOWED BY END-TO-END ANASTOMOSIS.

DR. ELLSWORTH ELIOT, JR., read a paper with the above title (for which see page 92).

DR. CHARLES N. DOWD said that the particular section of the intestine that was to be resected was a matter of much importance. In the region of the colon it became necessary, at times, to deal with a very troublesome condition, namely, the peritoneum, instead of lying close to the intestinal wall is separated from it by a thick deposit of fat. Even in the sigmoid flexure, where there is a distinct meso colon, the peritoneum may only be in contact with the muscular layer through one quarter of the circumference, a layer of fat one-half inch or even an inch in thickness separating it elsewhere. It is very difficult to obtain good union in this part; hence, if the end-to-end method is used, it is wise to insert enough gauze to provide for possible leakage. He had recently operated on three cases of sigmoid carcinoma in two of which he had used the end-to-end method—in the third a lateral anastomosis.

DR. WILLY MEYER said that in the early diagnosis of cancer of the large intestine the history given by the patient was very important. One symptom that could often be elicited early, was a peculiar sensation within the abdomen, a stiffening or feeling of contraction, as though from an effort to overcome an obstruction. Gurgling was another symptom, often made out by auscultation. Actual palpation of the tumor was certainly very difficult in many instances. If successful, operation frequently was too late. A satisfactory examination could only be made under a general anæsthetic, which ought to be more frequently resorted to in suspicious cases. If the symptoms were pointing to a malignant growth, and if the patient was steadily losing in weight and health, an exploratory incision should be insisted on.

DR. GEORGE WOOLSEY recalled two cases of carcinoma of the splenic flexure which came to him after obstruction had occurred. No previous symptoms could be elicited, and the only history obtainable was that one admitted that after he had drunk too much he had had stomach-ache which was relieved by a hot mustard foot-bath.

DR. HARTWELL said that at the recent meeting of the New York State Medical Association, Dr. James P. Tuttle had read a paper upon carcinoma of the intestinal tract, in which he had referred to the great frequency of the disease, especially in the large intestine, and he had quoted statistics to show that if the present increase went on, carcinoma would eventually cause more deaths than tuberculosis. The general profession had thus far failed to appreciate the importance of an early diagnosis in cancer of the lower gut, and the omission of an ordinary rectal examination was the rule rather than the exception. Only three weeks ago, Dr. Hartwell said, he saw a patient with a carcinoma of the upper part of the rectum, just above the reach of the finger, although it could be plainly seen with the proctoscope. That patient had been under treatment by a number of physicians for eighteen months, and had been sent to Colorado for supposed tuberculosis.

DR. ELIOT, in closing, said he would hesitate to introduce a large drain in these cases in order to prevent leakage, as he would be afraid that its withdrawal might tear open the suture line. He preferred a small intra-peritoneal gauze drain reinforced by the introduction of a rubber tube by an assistant to a point within the rectum beyond the suture line.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, October 2, 1905.

The President, HENRY R. WHARTON, M.D., in the Chair.

STAB WOUND OF THE LUNG.—TREATED BY SUTURE.

DR. JOHN H. JOPSON presented a young man, who, six weeks before, had been stabbed in the fifth interspace in the anterior axillary line of the left side. When the man was seen there was, in addition to signs of a developing pneumothorax, external hemorrhage, severe enough to make its active control desirable. The wound was enlarged, a part of the sixth rib resected, and inspection made of the pericardium and diaphragm, both of which proved to be uninjured. Examination of the collapsed lung revealed a cut, one and one-half inches long, as the active site of the hemorrhage. The lung was grasped by forceps, drawn out, and the hemorrhage controlled by a continuous catgut suture. The pleura was drained by means of a tube and gauze inserted in the original wound and also posteriorly in an opening made for that purpose. Pyocyaneous infection occurred and later pneumonia developed but the patient recovered. Now, at the end of six weeks, there remains a discharging sinus leading to a contracting cavity of moderate size.

In another case seen recently, there were five wounds in the back, one penetrating the pleura. In that instance Dr. Jopson did not resect a rib but simply plugged the wound with gauze. Symptoms similar to those in the present case developed. After two days the gauze was removed to allow the blood to escape. The wound was then replugged for two days when the drainage tube was inserted. The patient was recovering. Dr. Jopson is aware there is a great difference of opinion as to the control of hemorrhage and also regarding other points in the management of these

wounds; in the case shown, the control of hemorrhage seemed to be the imperative indication.

DR. ROBERT G. LE CONTE said that several years ago he had discussed before the Society the subject of penetrating wounds of the lung, and that he had had no reason since to change the opinions then expressed. His conclusions at that time were that when a wound of the lung is causing only slight hemorrhage, the external wound should be closed with gauze and the physical signs of bleeding watched for. When the hemorrhage is more marked, a small drainage tube should be inserted into the pleura and the admission of air regulated according to the difficulty of respiration in the patient. When the hemorrhage is large and the symptoms alarming, open the chest and insert a large drainage tube, so as to form a rapid and complete pneumothorax; at the same time, when necessary, give salt solution intravenously. When this fails to control the hemorrhage, as shown by the increasing failure of the pulse, it becomes necessary to resect one or more ribs and deal radically with the bleeding vessel, either by ligation, suture, or packing. In severe hemorrhage from the lung the first object is to get pressure on that lung, and this is best accomplished by opening the chest and forming a pneumothorax. The admission of air to the pleura is under perfect control, and it can be increased, diminished or stopped at will, should untoward symptoms appear. Besides permitting a collapse of the injured lung and bringing direct pressure upon it, the presence of air favors the formation of a clot in the severed vessel. This procedure in his experience has been sufficient to control a very alarming hemorrhage from the lung, and he had not yet had a case where resection of a rib was necessary, with suture of the lung.

GASTROENTEROSTOMY FOR GASTRIC ULCER.

DR. FRANCIS T. STEWART reported the following case to call attention again to the difficulty sometimes encountered in differentiating between carcinoma and extensive perigastritis the result of chronic ulcer of the stomach, and to emphasize the advisability of exploratory laparotomy in cases in which intra-abdominal malignant disease is believed to be present. In the upper abdomen a palpable carcinoma so often means the time for cure has passed, that some physicians counsel soothing medical treatment rather than surgical interference unless there are indications for some

palliative procedure. One can rarely be absolutely sure, however, that the condition is malignant, and right is on the side of the surgeon who explores such cases with the belief that he is dealing with an inoperable cancer, but with the hope that he will find gastric ulcer, or gall-stones, or chronic pancreatitis, or some other condition equally amenable to treatment, or, that in the event of malignancy, he will find the disease removable or at least so situated as to permit of some measure which will relieve the patient's suffering. His own patient, a man aged forty-two years, was admitted to the Polyclinic Hospital in September, 1904. He had suffered with indigestion for eight years, during which time, at irregular intervals, he would have attacks of vomiting which would relieve the almost constant pain he experienced in the epigastrium. Two years ago his appendix was removed by another surgeon without giving the hoped-for comfort. Three or four days before admission he had vomited a mouthful of blood, and this was the only time as far as he could remember. During the last year he has lost 77 pounds in weight. At the time of examination he was lemon-colored, markedly emaciated, vomiting all food, and suffering constant pain in the upper part of the abdomen. Beneath the upper part of the right rectus lay an immovable tender mass about the size of an adult fist. The stomach contents showed HCl .073 per cent., total acidity 51, and the presence of lactic acid. The stomach was not distended owing to the discomfort produced. Blood examination revealed hemoglobin 45 per cent., leukocytes 5,000 and red cells 3,000,000. Operation was performed September 30, 1904, disclosing a hard tumor involving the pylorus and adherent to and apparently infiltrating the pancreas, liver, colon and anterior abdominal wall. The adjacent lymphatic glands were swollen and indurated. With some difficulty a posterior gastroenterostomy without the loop and without the button, was performed. For six days following the operation the patient vomited large quantities of dark fluid which during one twenty-four hours amounted to 172 ounces. He refused a second operation and was thought at one time to be dying. The vomiting ceased rather suddenly but recurred at intervals for four weeks and then stopped permanently. The patient is now absolutely well, eats all sorts of food without any distress, has gained 62 pounds in weight, and no tumor can be detected on careful palpation of the abdomen.

DR. JOHN H. GIBBON recalled an exactly similar case upon which he operated two years ago. The mass involved the pylorus and was as large as a fist. He performed gastroenterostomy with the idea of later doing a pylorectomy or partial gastrectomy, but as in Dr. Stewart's case the patient went on to perfect recovery and is now perfectly well. Both these cases show the advisability of operating even in the presence of a large mass.

RECOVERY AFTER EXTENSIVE FRACTURE OF SKULL.

DR. WILLIAM L. RODMAN showed a patient upon whom he had operated two weeks previously for an extensive fracture of the skull. The man was struck with a beer bottle thrown with great force which mashed in the right side of the frontal region. When seen he was conscious, with a pulse of 62 and respirations 20. The fracture involved both the vault and the base of the skull and extended into each frontal sinus. Large fragments of the skull were removed and as the jagged bone had torn the meninges, they were further incised and the brain inspected and irrigated. A large blood clot was found but this had caused only slight paresis of the right arm. The frontal sinuses were packed to prevent infection. The patient unexpectedly made a prompt and uneventful recovery.

A TRANSVERSE INCISION FOR THE REMOVAL OF THE APPENDIX.

DR. GWILYM G. DAVIS read a paper on this subject (for which see page 106).

DR. WILLIAM L. RODMAN agreed that McBurney's operation is anatomically correct and usually satisfactory in clean cases; in pus cases it is inadequate and should not be employed. It would seem that any transverse incision is more liable than oblique ones to be followed by ventral hernia though Dr. Davis has not found this to be the case in the operation he advocated.

RADICAL CURE OF DIRECT INGUINAL HERNIA.

DR. GWILYM G. DAVIS read a paper with this title (for which see page 111).

DR. WM. L. RODMAN was much interested in Dr. Davis's statements regarding direct inguinal hernia. He believes the

frequency of this type is greatly over-rated by anatomists ; instead of being in the ratio of 1 to 5 as usually stated, he considers 1 to 25 more nearly correct. In more than 300 operations for hernia he has rarely seen the direct form, though recently he operated upon two cases in one day, one of them being a hernia of the bladder, the only one he has ever seen. He has never encountered the conjoined tendon as a covering of a hernia and does not see why it should be so, it being very easy for the gut to slip around the muscle and, going in the direction of least resistance, carry with it the transversalis fascia instead ; the former condition may occur in persons with great muscular relaxation but does not take place usually. Dr. Rodman made this point in a lecture several years ago when Dr. Coley was present and this experienced operator agreed that the conjoined tendon was rarely, if ever, present as a hernial covering. Dr. Rodman finds the transplantation of the sheath of the rectus, after Halsted's method, very satisfactory and is resorting to it with increasing frequency and confidence in cases of relaxed musculature. He does not operate on direct hernia with the same confidence that he feels regarding the indirect form but considers Halsted's method of transplanting the anterior sheath of the rectus and also using the cremaster muscle as distinctly strengthening the wall. Operated upon in this way, direct inguinal hernias will seldom recur. He has had but one recurrence of a direct hernia in the comparatively small number he has operated and this was reoperated by Halsted's method *four* years ago and remains perfectly cured. The patient is a motorman, leads a very active life, and has given the cicatrix sufficient test. Recurrence, in any hernia, is rare after one year.

DR DAVIS, in closing, said the experience of various surgeons differed greatly as to the proportion of direct to indirect hernias. The number of the former is not large but, though he does not see many of them, he operated upon five hernias in four patients within a short time during the past winter. As to the occurrence of hernia in the transverse incision for appendicitis, in the case of the short incision, the inner half, three-fourths inch, is blocked by the rectus muscle and the outer half by the transversalis and external oblique. When the larger incision is employed, the inner two inches is blocked by the rectus and the outer three inches by the internal oblique and the transversalis which are cut in the direction of their fibers. The only aponeurosis divided diago-

nally to its fibers is that of the external oblique and it seems to heal strongly and satisfactorily.

APPENDICEAL ABSCESS POINTING IN THE RIGHT SIDE OF THE SCROTUM IN A PATIENT FREE FROM HERNIA.

DR. ROBERT G. LE CONTE reported the case of a man, aged twenty-one, colored, who was admitted to the Pennsylvania Hospital on the morning of July 17, 1905, with the following history: Seven days previous to admission he was seized with pain in the abdomen and vomiting. Fever developed soon afterwards, and the abdominal pain continued, with rigidity and tenderness over the appendix. The night before admission the pain suddenly extended to the right scrotum, with the appearance of a tumor in this region.

On admission the temperature was 102° ; pulse 104; respirations rapid; facial expression pinched; mucous membranes blanched. The abdomen was slightly distended and tympanitic, with marked rigidity on the right side and exquisite tenderness over the whole lower right quadrant, where a diffuse mass could be made out, the feeling of tumor extending down to the right inguinal ring. The external inguinal ring and upper portion of the scrotum were filled with a tumor the size of an orange, the overlying skin being reddened and edematous. This swelling was tense, dull, without fluctuation or impulse on coughing, and did not diminish with taxis. No history could be elicited of a previous hernia, and as the man had been in bed for a week the probability that this mass might be inflamed omentum was remote. There was no obstruction of the bowels, they having been freely moved the night previous. It was therefore thought that a patent funicular process had existed since birth, into which an appendiceal abscess had ruptured.

Ethyl chlorid and ether were used for narcosis, and a three-inch incision was made over the scrotal mass, extending from the external ring downwards. As the dissection proceeded a thick, inflammatory capsule was opened and a large quantity of pus evacuated with a typical appendiceal odor. The finger readily passed through the inguinal canal into the abdomen, but only a rounded channel could be felt and no portion of the appendix was within reach. Owing to the precarious condition of the patient further operative procedure was not considered. A drainage tube

was inserted through the internal abdominal ring into the abdomen, and a portion of the wound closed with silkworm gut sutures.

The following day the patient's condition was still very serious; pulse rapid and weak; temperature 102.4; discharge on the dressings was very free. He responded fairly well to free stimulation. The day following his condition had somewhat improved. From then on convalescence was fairly rapid, although the temperature remained elevated for a week. The wound gradually closed, until only a small sinus resulted, with persistent discharge.

On August 23 the patient consented to a second operation for the removal of the appendix. This was done by Dr. Hutchinson.

Ethyl chlorid and ether narcosis. Incision was made along outer border of right rectus below umbilicus, and was gradually prolonged until the internal abdominal ring was exposed. On opening the abdomen the intestines were found matted together, and after some difficulty the cecum was recognized and in part isolated. What appeared to be the stump of a sloughed-off appendix was caught and ligated, but later, after breaking up still more of the adhesions in an attempt to trace the sinus to the scrotum, the real stump of the appendix was found in a retro-cecal position. It was patulous and oozing a small amount of fecal material. The stump was tied, inverted with a pursestring suture of chromicised gut, followed by a few Lembert interrupted sutures. The tip of the appendix, which had sloughed off, was found still further posterior to the head of the cecum in an opening through the pelvic peritoneum, the cavity resembling somewhat the sac of a hernia. On removing it a fecal concretion about as large as a bean was also found in this pouch. A probe entered in the scrotal sinus passed directly into this pouch, the sinus being entirely posterior to the pelvic peritoneum, and in that sense extra-peritoneal. The sinus was curetted and the sub-cecal region drained with iodoform gauze. The wound was partly closed.

An uninterrupted recovery followed this operation, and by the 10th of September the wound and sinus had entirely closed, and on the 13th the patient was discharged cured.

An interesting and unexpected feature in this case was the perforation of the pelvic peritoneum with the burrowing of the

abscess outside of the peritoneal cavity, the pus finding its way into a previously normal inguinal canal and scrotum. In this case there was no history of a hernia, nor did the operation show that one had previously existed. It seems strange that the pus after having broken through the pelvic peritoneum and reached the psoas muscle—did not follow this muscle and point in the usual position for psoas abscess, instead of entering a normal inguinal canal.

DR. JAMES P. HUTCHINSON said the most interesting point to him regarding the case was his mistake of opening too low down for the appendix, though this part was relatively free from adhesions as compared with the upper part. The appendix was difficult to bring up and he believes he tore the organ from its cecal attachment during the attempt at removal. When the other portion was removed it was patulous; hence the belief that the concretion came from the appendix and not from the cecum.

STONE IN THE CYSTIC DUCT.

DR. CHARLES F. MITCHELL presented a specimen obtained from a patient whose gall-bladder contained seventy-five gall-stones and a quantity of pus. The cystic duct was dilated as was also the hepatic duct, the latter readily admitting a finger. A number of stones were removed from the hepatic duct. Following operation the patient developed many complications and finally died. At autopsy the cystic duct was found to be almost occluded by a faceted stone which was probably left in the hepatic duct at the time of operation.

DR. JOHN H. GIBBON found the patient referred to by Dr. Mitchell in his ward when he went on duty; the gall-bladder wound was still draining but in a few weeks it entirely closed and there were no symptoms referable to the liver. A rectovaginal fistula which had developed shortly after the gall-bladder operation was the important feature at this time. Dr. Harte regarded it as the result of numerous turpentine enemata; at one time a spoon had also been used in removing hardened feces. Pure pus was discharged from the fistula about one week after Dr. Gibbon took charge and in a few weeks this was repeated. At these times there was a chill and rise of temperature and the patient developed a low sepsis. Dr. Gibbon concluded there was an abscess cavity in the abdomen, originating in the appendix or a

tube, and emptying into the bowel. As Dr. Mitchell found the appendix normal when he operated, that organ seemed to be excluded. Because of the infiltration about the fistula a satisfactory examination of the tubes could not be made. Exploratory operation was possibly too long deferred but the abdomen was finally opened. The peritoneal cavity was full of light, straw-colored fluid. The tubes and ovaries were slightly adherent to the surrounding structures but no abscess was found. The rectum was adherent to the uterus and attempt to separate them resulted in the finger passing into the rectum. In closing the fistula, two other small openings into the vagina were found; the rectum was an unrecognizable cavity containing a quantity of pus. The patient was practically pulseless when operated upon and died in a few days of peritonitis. At autopsy it was found that three or four inches of the rectum in the hollow of the sacrum had sloughed. A small tract extended upward along the sheath of the psoas muscle but there was no distinct cavity at the upper end. No other pathological condition was found although a careful search was made. Dr. Gibbon believes that the lower three or four inches sloughed because of the injury done by the turpentine.

AN UNUSUALLY LARGE PREPATELLAR BURSA.

DR. JOHN H. GIBBON presented this specimen which before removal was as large as the patient's knee. It was of several years' duration and had never been tapped. The work of the patient had not required the kneeling position. Portions of the bursa are so hard as to suggest the presence of calcareous material but the exact nature has not been determined as the sac has not been opened. A great deal of redundant skin was removed with the bursa. The bursa was dissected away from the patella without rupture and was shown after it had been hardened in formalin solution.

CORRESPONDENCE.

SUTURE OF RUPTURED BICEPS TENDON.

EDITOR ANNALS OF SURGERY:

IN ANNALS OF SURGERY, Vol. XLI., 1905, p. 756, I published a short paper on Rupture of the Tendon of the Biceps Muscle and reported a case of my own. Inasmuch as operation for this injury is very rare (there only having been 4 cases reported up to that date), I think it may interest surgeons to know one further fact in reference to my patient. The operation was done on Dec. 18, 1904. He has just called to see me to state the following facts: He has resumed his athletic life, and among other feats he frequently swings from one trapeze to another over a distance of seven feet. Recently, on two occasions, he missed catching the second trapeze with his left hand and the entire weight of his body, about 120 pounds, with its momentum in flight through the air was borne by the right arm alone, the arm itself being in flexion. No injury or inconvenience of any kind has followed these two accidents. It seems to me, therefore, proof of a very firm union following the overlapping and suture.

WILLIAM W. KEEN.

PHILADELPHIA, December 20, 1905.

RUPTURE OF INTESTINE.

EDITOR ANNALS OF SURGERY:

IN the November number of the ANNALS OF SURGERY Dr. R. P. Campbell furnishes an interesting article upon Rupture of Intestine, in which he enumerates twelve cases of successful operation for this injury, as culled from English and American journals since the year 1894. I would like to call attention to a case of my own, published in the January 23d number of the *New York Medical Record*, for 1904, under the title of "Two Cases of Abdominal Traumatism," and to place on record a second opera-

tion for a similar condition. These two cases constitute the total number upon which I have operated. A man, seventy-four years of age, generally healthy, who had had a reducible inguinal hernia on each side for some years, while lifting a 75-pound cast-iron drum of a cooking-stove into position was seized with an agonizing pain in the belly, which caused him to drop on the floor and lie there writhing. Five hours later he was seen by me. I found a somewhat under-sized spare man of fair muscular development, with large inguinal rings, but no bowel in the scrotum. The abdomen was not found distended, but its walls were hard and the muscles rigid. Tenderness was felt on palpation all over the abdomen but was especially marked in the left lower quadrant, at its upper part. The bowels had moved the day before. P. 80; T. 90°.

Two hours later, after removal to hospital the abdomen was opened in the median line below the navel. Turbid serous fluid escaped; no bowel in inguinal canals. One or two congested and somewhat distended coils of small intestine were now allowed to come out through the wound. Some lymph seen on them, and at one point a small perforation about an eighth of an inch in diameter. This opening was closed by two rows of silk Lembert's sutures, and after sponging off the coils of bowel and returning them, the abdominal wound was united with through and through silkworm gut sutures. An uncomplicated recovery followed.

There was no evidence of the intestine at the point of rupture being in any way weakened by pre-existing disease, so as to predispose to its bursting at that part.

A. B. ATHERTON, M. D.

FREDERICTON, N. B., December 22, 1905.

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ORIGINAL MEMOIRS.

SURGICAL INTERVENTION IN TUBERCULOSIS OF THE MENINGES AND OF THE BRAIN.¹

BY ROBERTO ALESSANDRI, M.D.,

OF ROME,

Professor of Surgical Pathology in the University of Rome, Chief-Surgeon in the Policlinic
Umberto I.

How frequently the meninges and the brain are affected by tuberculous lesions is too well-known to detain us. It is in childhood that the greatest number of cases occur. It is almost always a question of secondary tuberculous localisation, and often the final phase of a glandular, visceral or osseous tuberculosis which at a given moment breaks out in the miliary form.

For our purpose it is important to keep in mind that the greater number of cases also present anatomo-pathologically diffuse lesions, in form of exudations or multiple nodi, such as the eruption of tubercles upon the meninges and along the vessels, and that generally as their seat they prefer the base,—now the base alone, now together with the convexity in greater or less extent,—and sometimes also the spinal meninges; this signifying that in the greater number of cases, the intervention of the surgeon is impossible.

¹ Read at the International Congress of Tuberculosis in Paris, October, 1905.

However, we know also a limited form of tuberculosis of the meninges and of the brain; tuberculous gumma, tuberculous conglomeration. Oftenest it at the same time affects the meninges and the cortex, and sometimes is isolated in the depth of the brain substance. This form of tuberculosis is in its clinical aspect quite different.

All this is well known; it suffices to mention it. What is also well established is that the frequency of occurrence of the two forms is very different. And the proportions change, according as we consider children or adults. I think it is useless to repeat here figures that can easily be obtained from the numerous statistics published.

We have then to distinguish in their anatomo-pathological and clinical aspects, tuberculous meningitis, and the solitary tubercle of the brain.

It is true that between the two forms a distinction in the true sense does not exist, and we can pass from one to the other by numerous intermediary degrees. It is equally true that the two forms are often united, and we find one or several masses of tubercles at the same time with a more or less diffuse lesion of the meninges, a classic meningitis contemporary or consecutive.

In any case the two varieties are very distinct in their typical forms and the possibility and the results of surgical intervention must be considered separately, according as we treat of the one or of the other.

Of Intervention in tuberculous Meningitis. I have already said that in tuberculous meningitis in general, surgical intervention is considered almost impossible. However, I do not think the following considerations will be without their value:

(a) Tuberculous meningites do not all present themselves under the form of miliary eruption, they are not all equally diffuse, nor in the same region of the brain.

(b) Although of very rare occurrence, a spontaneous healing of the process is nowadays considered possible.

That being so, will Surgery never be able to lend assistance?

(a) As to the first point, numerous researches tend now-

adays to compel our admission that lesions of the meninges are sometimes limited, and present a course that has not the usual forms. I will only mention the well known essay of Chantemesse¹ in which he clearly established the special form of tuberculous meningitis *en plaque*, with quite special anatomical and clinical characters: it consists most frequently of confluent grey granulations, of yellowish pseudo-membranes or fibrous scleroses. The seat may be limited to the convexity of the brain and often to the region of the psychomotor centres.

Chantemesse distinguishes primary and secondary forms. Madeleine² justly remarks that we can, at most, speak of meningites which are clinically primitive without being anatomically so in every case.

See also the cases reported by Combe³ and by Monnier.⁴

Trevelyan,⁵ in 114 cases of tuberculosis of the nervous system, observed during a course of twenty years at the "Leeds General Infirmary" reports nine of this class in which there were observed thickenings localised over a limited extent of the cortex (Meningitis *en plaque*).

It must be observed that he clearly distinguishes these last cases from those with tuberculous masses (solitary tubercles) in the brain, of which he reports 33 in 114 cases, as we shall see later on.

A similar case calls for consideration, namely, that of Tuffier,⁶ who operated a phthisical patient, aged twenty-nine years, suffering also from spasms and paralysis, and affirms that it was not a matter of solitary tubercle, but a plaque of tuberculous meningo-encephalitis. Sænger⁷ reports also three cases of tuberculous lesions localized in the meninges, of which one in the left sylvian fissure in a woman of thirty-two years, another in both sylvians, in a man of fifty-eight, the third in the left sylvian in a man of fifty-two. Corresponding with the locality of the lesions there were focal clinical symptoms; in the first case, aphasia and right hemiplegia; in the third case right hemiplegia. It is to be observed that these were adults. We see from this that there exist cases, although rare, of lesions of the meninges of the ordinary type, but limited.

In the statistics given by Weingärtner⁸ of 245 cases in the anatomo-pathological institute of Kiel there was not one

that exhibited circumscription in the convexity. Leitz,⁹ on the other hand, reports 3 cases of it in 67 (adults).

In this connection I wish to give four years' statistics from autopsies made at the school of Pathological Anatomy of the University of Rome. I owe them to the kindness of Professor Marchiafava, the Director, and his assistants, Doctors Nazari and Ugolini, who have been so good as to furnish me with them.

In about 1200 autopsies there have been in all 57 cases of tuberculosis of the meninges and of the brain.

As to Age.—Fourteen cases were children below five, fifteen between five and ten years, eleven between ten and fifteen, nine between fifteen and twenty, and eight above twenty years.

In this respect these data do not show much difference from statistics already known.

As to the anatomical form it was always meningitis more or less diffuse. In one case only (a man of thirty-seven years) there were solitary cortical tubercles in the left hemisphere.

Of the 56 cases, in 54 the meningitis had its seat at the base, and in these 54, ten had also reached the vault and oftenest in limited points as follows: above the right parietal lobe, at the foot of the first and second frontals, along the pararolandic, once with extensive softening of the left cerebral hemisphere (paracentral circonvolutions and parietal lobe).

Finally twice the tuberculous lesion was limited to the convexity of the brain, more particularly, once especially to the right half, and the other time especially on the paracentrals.

I do not intend to dwell on this point, nor to draw conclusions from a small number of cases.

I have given the above data, because in a question of such difficulty every contribution is interesting, and because I intend to weigh all the possibilities in order with more confidence absolutely or partially to reject surgical intervention.

(b) The healing of tuberculous meningitis is to-day considered possible, and medical literature reports some cases of it. With respect to this, Trevelyan justly remarks that we must make a distinction between the ordinary diffuse meningitis and meningitis circumscribed en plaque.

It is certain that compared with the enormous quantity of cases followed by death those cured would represent a small proportion: however there have been some. Even if we consider doubtful those adduced by Politzer,¹⁰ by Rillett,¹¹ and perhaps even those by Barth,¹² Cadet Gassicourt,¹³ and Carington,¹⁴ in which all the same a healing of the lesion was anatomically demonstrated—that also reported by Dujardin Beaumetz¹⁵ in which tubercles were discovered in the choroïd—and those by Cufer,¹⁶ Chappet,¹⁷ and Ward,¹⁸ in which the diagnosis was based upon the presence of tuberculous lesions in other parts of the organism,—still there are other cases that do not admit of doubt. Thus the case reported by Freyhan,¹⁹ in which bacilli were discovered at the lumbar puncture, and in which none the less the patient was cured and survived five years in constant good health without further symptoms. Jannsen's²⁰ patient died, three years after, of pulmonary tuberculosis, and the autopsy showed along the longitudinal fissure a soft yellowish mass consisting of round nodi of detritus, and in different parts of the pia mater of grey perivascular nodi. Henkel's²¹ patient (bacilli in the spinal liquid) was still well after a year. Mermann²² also reports a case of typical tuberculous meningitis, which seemed cured and the subject well for four months; then there was a return of the symptoms and death after ten days; on the examination after death typical tuberculous meningitis was proved.

If, as the author believes, this last case proves that there is always a tendency to relapse, or rather to a recrudescence of the process, and that consequently we have only an apparent cure, it loses nothing of its values as evidence.

Besides in all surgical tubercloses and especially in osseous and articular tuberculosis, we have cures we call clinical or apparent, which are none the less true cures properly so called and may even become complete in the true anatomopathological sense of the word.

Let us consider also the later cases of Rocaz²³ (the diagnosis was based on the seroreaction of Arloing Courmont) reported and anatomically demonstrated by Cruchet,²⁴ those of K. Barth,²⁵ with discovery of bacilli; of Gross,²⁶ equally with positive discovery of bacilli resisting acids and of the morphol-

ogical type of Koch; of Thomalla,²⁶ with tubercles in the choroid, of Sepet,²⁷ (seroreaction); of Winkler and Gohl,²⁸ with positive discovery of bacilli; of Mottard,²⁹ anatomically confirmed.

An important case has lately been communicated by Avanzino³⁰ of the Pammatone hospital at Genoa: the diagnosis of tuberculosis was based upon lesions of the optic papilla, on the leucocyte proportion of the liquid obtained from the lumbar puncture, and on the positive result of inoculation in guinea pigs.

See also the case I myself have operated and which I report below. Sepet³¹ supports the opinion of Poncet, that is to say that we can have, fairly often, benign forms of tuberculous meningitis capable of cure and he distinguishes four anatomical varieties of it, among which he includes a light curable form of tuberculous meningitis, whose healing is due to attenuation of the virulence of the bacilli, or to increased resistance of the organism. We may add that to this last case probably belong a large number of limited or partial meningitis. See also with regard to this, the articles of Mollard and André,³² of Dor,³³ of Bondet,³⁴ and Parrenin's³⁵ essay.

Maragliano³⁶ also admits the possibility of cure in some cases and he believes, that for this purpose, it may be useful to prevent, if one can, the mechanical effects of exudation. "Surgery alone," he says, "can answer this necessity in serious cases of richly fibrinous and stratified exudations."

To obtain decompression, besides the lumbar puncture, punctures have been tried of the lateral ventricles, of the fourth ventricle and its reservoir; in the well known case brought forward by Hord,³⁷ as there was coma and marked phenomena of compression, in the third week the fourth ventricle was punctured, and the patient recovered. But was it really a case of tuberculosis?

I think it would be useless to repeat here the various remarks published relative to similar punctures and decompressive evacuations, and besides it would take too long.

I will only mention the following fact: Concetti,³⁹ having ascertained the uselessness of the lumbar puncture from the therapeutic point of view, tried to use it with the object of

introducing directly into the cavity of the meninges certain medicines believed to be effective against the tuberculous process. After having drawn away from ten to twenty cubic centimeters of cerebro spinal liquid, without in any way displacing his needle, he injected by means of it into the arachnoid cavity from 5 to 8 cubic centimetres of iodoformed oil of almonds at 1 per cent., or from 5 to 10 grammes of an aqueous iodo iodurate solution (1-10-100). But without result, and he abandoned the practice.

I wish to mention also the attempts made by Prof. Rotgans,⁴⁰ "Experimentally it seems possible to irrigate the base of the brain. Injecting a warm solution of colored gelatine at any point of the subdural cavity of the cranium, above the tent of the cerebellum, one finds the gelatine over the whole extent of the arachnoid, as well at the base as at the surface of both hemispheres." Guided by this Professor Rotgans, in two cases of tuberculous meningitis, injected an iodoformed emulsion into the subdural cavity. It is true he found in his autopsies, the iodoform at the base, but the children, operated when already in coma, succumbed one or two days after the operation, which was without result.

Very interesting also is a case reported by Winkler and Rotgans⁴¹ which I will summarize here:

"A little girl of eleven years, with chronic otitis; tuberculous bacilli were proved present in the pus. She was trepanned above the postero superior part of the temporal lobe for a left lateral epilepsy, starting from the angle of the mouth. Leaving the dura mater intact they drew out from a depth of about one centimetre a considerable quantity of seropurulent liquid, and injected in its place an equal quantity of iodoformed emulsion. Some weeks later and two or three times afterwards they repeated the same treatment through the skin at the level of the crown of the trepan. At first the result seemed favorable and the Jacksonian attacks ceased; but a year later she was in the psychiatric clinic, mad, with all four limbs contracted and amaurotic through papillary atrophy. She died completely mad in November 1899. At the autopsy they found tuberculous meningitis of the base with very acute internal hydrocephalia.

Intraventricular injection is therefore possible and even with an immediate amelioration.

Of the same kind are the experimental labors of Nan-

notti⁴² in the treatment of meningites. After having provoked several forms of meningitis in dogs he tried treating them with subdural injections of sublimate. And he obtained excellent results in the forms of tuberculous meningitis, while in the forms of acute suppurative meningitis he had none at all. He concludes therefore that tuberculous meningitis (at least that which is obtained by experiment in dogs) is susceptible of cure by his method; that the cure may be obtained even if the treatment takes place in the most advanced stages of the disease; that the process of cure of tuberculosis of the meninges has many points of contact with that of peritoneal tuberculosis, studied both by the author himself and by others.

After these results, he proposes to apply the treatment of subdural injections of sublimate to man.

However, as far as I know, the application has not been yet tried.

Taking into account the essential difference of tuberculous lesions obtained experimentally and of the resistance of the dog, these results have still a considerable value.

Chipault⁴³ recalls cases of tuberculosis of the vault of the cranium, complicated by meningo-encephalic lesions, of which the typical form is the perforating tuberculosis with hour-glass collection in two parts, the one extra, the other intracranial: and reporting certain cases of it, he mentions having observed some himself. The case observed by Guarnieri seems to have resembled this type.

Chipault⁴⁴ reports also a very interesting case of primitive tuberculosis of the diploë, with perforation of the internal and cortical phenomena; it seems however that lesions of the meninges were wanting. It is very seldom we have had more active interventions, and they have always been negative in their results. Attempts of this nature have been reported by Romme.⁴⁵ Chipault quotes a case from Masbrenier⁴⁶ in which through erroneous diagnosis, intervention was made above the vault. Trevelyan quotes other interventions practised with the same object by Lannelongue and Keen,⁴⁷ by Ord and Waterhouse,⁴⁸ by Parkin,⁴⁹ Paget,⁵⁰ Kendal Franks,⁵¹ and others; he reports one equally doubtful of Mayo Robson⁵² at the Leeds Infirmary.

	OPERATOR	YEAR OF PUBLICATION	AGE AND SEX	SEAT AND VOLUME OF TUBERCLE	RESULTS	
					IMMEDIATE	LATER
1	MacEwen (?)	1885	Male, 36 years (Duret erroneously notes female 7 years).	Plaques of meningitis and encephalitis circumscribed (tuberculous?) on the ascending frontal (a small nut).	Cure	Continued 8 months later.
2	Horsley	1887	Male, 22.....	Tubercle of the third middle inferior of the ascending convolutions (ball of the thumb) 2 mm.	Cure	Six years after, vertebral tuberculosis; 18 months after, pyelidymitis and tuberculous nephritis. Dead.
3	MacEwen	1888	Female, 7..... (Duret—Male, 37)	Subcortical tubercle in the upper part of the ascending convolutions (little nut).	Cure	
4	Knapp and Bradford	1889	Male, 32.....	Subcortical tubercle in the posterior portion, middle third of the Rolandic region (weight, 35½ grams).	Death after ¾ hr.	
5	Mercanton and Combe	1889	Female, 12.....	Solitary tubercle in the middle part of the ascending frontal convolution.	Cure	Death 4 or 5 months after the operation. At the autopsy, 4 tubercles were found at different points of the cerebrum and cerebellum.
6	Booth and Curtis	1893	Male, 35.....	Hour-glass tubercle in the frontal region (weight, 20-25 grams).	Cure	Death within two months, from relapse. Multiple.
7	Winkler and Guldenarm (?)	1893	Male, 19.....	Calcified tumor on the anterior central (healed tumor?) 2½ cm.—1½ cm. Weight, 12 grams.	Cure	Sudden death 2½ years after.
8	Czerny	1894	Male, 23.....	Tubercle of frontal region. As large as a fist (weight, 205 grams).	Cure	Re-operated for tuberculous meningitis, and died 4 years after.
9	Schwartz	1894	Male, 33.....	Tubercle of Rolandic region (centre of superior member). As large as a nut. 6 × 2 cm.		Death from tuberculous meningo-encephalitis 1½ months later.
10	Krönlein	1895	Male, 43.....	Tuberculome in the inferior part of Rolandic region. As large as a hen's egg.	Cure	Still living and in fairly good health in 1901.
11	Tassi	1895	Female.....	Tubercle in the frontal region (hazel nut).	Cure	Death some months after.
12	Broca	1896	Male, 35.....	Tubercle in the middle third of the ascending frontal and foot of the second frontal; partial removal with the spoon.	Amelioration	
13	De Paoli	1897	Female, 18.....	Tuberculome of the right motor zone.	Nil	Death at the end of 5 months.
14	Sick	1897	Female, 24.....	Solitary tubercle like a hazel nut, behind the central posterior convolutions.	Cure	
15	Schnitzler	1898		Tuberculome of the right precentral circonvolution.	Died after 26 hours	

TUBERCLES OF THE CEREBRUM OPERATED—(Continued).

	OPERATORS	YEAR OF PUBLICATION	AGE AND SEX	SEAT AND VOLUME OF TUBERCLE	RESULTS	
					IMMEDIATE	LATER
16	Heidenhain ¹ .	1889	Male, 29.....	Solitary tubercle, subcortical, of the paracentral lobule (size of a small hazel nut).	Cure	Continuing 2 years after.
17	Roux	1900	Female, 7½	Tubercule of the Rolandic region (size of a mandarin orange). 4.5 × 5 cm.	Cure	Continuing 2 years, 10 months after.
18	Roux	1900	Male, 38.....	Tubercule of the Rolandic region—ascending parietal (size, pigeon's egg).	Cure	Lasting 5 months after.
19	Lunz	1903	Female, 22	Tubercle of the Rolandic region (size of a nut).	Cure	Death at the end of three months. At the autopsy, multiple tubercles found in the right parietal and occipital lobes, in the sinus of the callosal bodies, and in the great falk of the cerebrum: tuberculous leptomeningitis.
20	Durante	1903	Male, 23.....	Tubercle of the third superior of the ascending parietal and of the anterior portion of the upper and lower parietal circunculations.	Cure	
21	Tuffier	1903	Male, 29.....	Plaque of tubercular méningo-encephalitis in the left Rolandic region.	Cure	Continuing (July, 1905).
22	Alessandri....	1904	Male, 31.....	Tubercule of the Rolandic region—third superior (size of a small nut). 5 × 2½ cm.	Cure	

TUBERCLES OF THE CEREBELLUM OPERATED.

	OPERATORS	YEAR OF PUBLICATION	AGE AND SEX	SEAT AND VOLUME OF TUBERCLE	RESULTS	
					IMMEDIATE	LATER
1	Bennet,	1887	Male, 7.....	Tubercle of the right hemisphere (pigeon's egg).	Death	From shock after 4 hours.
2	Horstey	1887	Male, 18	Tubercle of right hemisphere (weight, 7 grams).	Death	10 hours after.
3	MacEwen	1893	Male,	Two tubercles of the cerebellum (one the size of a nut, the other smaller).	Cure	Died 10 months after, through relapse.
4	Parry	1893	Male, 5½.....	Tubercule in left hemisphere. Incomplete removal with spoon.	Death	From hemorrhage or shock some hours after.
5	Lampiasi	1895	Male, 45.....	Tubercle of the left hemisphere (size of a chestnut).	Death	Of shock at the end of 15 hours.
6	Collins and Brewer	1897	Male, 26.....	Tubercule of right hemisphere (diameter about 2 cm.). Removal in 3 fragments by spoon.	Cure	Died 2½ months after.

Published by Bayerthal, Mun. Med. Woch., 1899, No. 46. Afterward communicated by Heidenhain himself to the German Congress, 1901.

In Italy I only find five cases of interventions in tuberculous meningitis registered. They are those of Raffa,⁵³ of Guarneri,⁵⁴ of Codrilla⁵⁵ and two of Caselli.⁵⁶ In these two last there was a mere supposition of tuberculous meningitis, but on operating nothing was found. Those of Raffa and Guarneri are published in the report read by Roncali before the Twelfth Congress of the Italian Society of Surgery (1897), the others are reported in the collection of Chipault. In the case of Caselli the operation did not confirm the diagnosis; the case of Guarneri may be classed with those of cranial lesions with diffusion to the contents. The result was negative in all these cases.

I have myself⁵⁷ lately operated a child whose lesions led me to believe there had been a tuberculous meningitis, limited and healed.

The child was an orphan of eleven years. All hereditary syphilis was excluded; the mother died of chest complaint. There is a sister affected with ordinary epilepsy.

He had always been well until three years ago, when he began to suffer from convulsive attacks of clonicotonic type; these attacks begin in the muscles of the left hand, spread then through the whole arm, the face and the leg on the same side. It is impossible to give precise data as to the beginning of the affection; it commenced, it seems with fever and general cerebral symptoms; it is certain that all at once the attacks became more frequent, and after some time again more rare. While he was at the hospital they were repeated at irregular intervals of a few days, of a month, and even more, generally two or more attacks in the same day, the duration was always of a few minutes, without loss of consciousness; no emission of fecal matters, nor of urine; the patient did not foam, nor bite his tongue. The attack always commenced in the upper left member, spread sometimes to the face, at others to the leg, but always on the left side. It is to be noted that the attacks are generally preceded and followed by an increase of temperature (even to 38° degrees) which ceases by lysis. The objective examination presents nothing abnormal; only the muscular force of the right arm gives 25, that of the left 14. Otherwise, nothing as to mobility nor sensibility nor of the organs of the specific senses.

Operated by craniectomy; on the middle part of the right rolandic zone we found the dura mater thickened and resisting irregularly for an extension of about four by five centimetres; adhesions partly light, partly fibrous, to the soft meninges and cortical substance, especially visible along the vessels, and eche-lonned in nodular form in the two paracentral circonvolutions (middle part). We detached the adhesions, putting iodoform gauze in the wound on account of the fairly considerable hemorrhage, with partial suture of the dura mater, and replacing of the flap.

Healing per primam with quite normal course. On the eleventh day, a very slight attack, lasting a minute and limited to the arm and left side of face. After that, condition normal.

Although there is no diagnostic certainty, the age, the anamnesis, the lesions found on operating and above all the disposition of the adhesions along the vessels make me think that probably they were the results of tuberculous meningitis spontaneously cured.

In conclusion of what concerns the first part of my report, we must agree that, in the greater number of tuberculous processes of the meninges, above all in cases that run their course with the usual forms, surgical intervention is not to be advised, and the few cases in which it has been tried have not had success.

The different operations with decompressive scope have for the most part only a temporary value. The simple lumbar puncture has been up to now the operation preferred, on account also of its high diagnostic value. In some rare forms of meningitis in plaques, of meningitis of chronic course with localisations prevalent upon the meningian vault, or in the consequences of a localised and healed tuberculosis of the meninges we can speak of active surgical intervention. Those cases, besides, may, up to a certain point be classed among the lesions I am going to describe in the second part of my report.

Although we cannot repose with too much confidence upon the results of intervention in such cases, we must not either reject it a priori; the progress obtained in the domain of surgery exists to prove to us that, very often, successes have been obtained which theoretically seemed impossible.

Of Surgical intervention in the solitary tubercle of the brain.—When the tuberculous lesion does not take the ordinary form of a more or less diffuse meningo-encephalitis, we have what is called “solitary tubercle” whose form is generally almost spheroidal. This lesion is almost called Tuberculous Gumma, or tuberculous conglomerate, and its clinical physiognomy causes it to be classed among cerebral tumors.

Generally this type of tuberculous lesion does not affect the dura-meninge; on the contrary it attacks the pia mater at the same time as the cerebral substance in which it is embedded. It is not rare either to find it quite subcortical, without any relation with the meninges from which it is entirely removed (oval centre).

From statistics the frequency with which we find solitary tubercles in the brain is very great, above all in children. But, age apart, two other conditions are of the highest importance for the subject in hand: the part of the brain which is the seat of the tubercle and the unity or multiplicity of this last. With regard to frequency in general the statistics furnished by Allen Starr,⁵⁸ quoted in all treatises, gives out of 600 cases of cerebral tumors examined on the anatomical table, 193 solitary tubercle while the sarcomæ and gliomæ, though they are the neoplasms of most frequent occurrence are respectively only 120 and 91. The statistics of Birsch Hirschfeld⁵⁹ give 132 tubercles in 342 tumors, those of Hale White⁶⁰ 45 in 100. Durante⁶¹ combining the statistical data of Starr, Seydel, Bernhardt, White and Birsch-Hirschfeld, in a total of 1633 cases of endocranial tumors, gives 489 tuberculosis to 414 sarcomata, 253 gliomata, and a smaller number of other less frequent varieties.

With regard to age, in 125 cases of tuberculosis in children, Simmonds⁶² gives 16 solitary tubercles (12.8 per cent.), Schwer⁶³ 21 in 96 (21.9 per cent.); Boltz⁶⁴ 18 in 161 (11 per cent.); altogether 55 solitary tubercles in 382 cases of tuberculosis (14.4 per cent. and 2.1 per cent. for all autopsies). Hamann⁶⁵ at the Anatomico Pathological Institute of Kiel, found, in five years, among adults, 15 cases of solitary tubercles, equivalent to only 4.3 per cent. of the cases of tuberculosis. Plambeck,⁶⁶ in ten years, found still less, 9 cases

(1.8 per cent.); altogether among adults, in fifteen years, the cases of solitary tubercles represent only 3.1 per cent. of the cases of tuberculosis, and 0.7 per cent of the total autopsies.

So, among children, the frequency would be about four times greater than among adults. According to Starr, of 193 cases collected by him 152 referred to individuals below twenty years and 41 cases only to adults.

The report as to other tumors also has its importance. While among individuals below twenty years we have 37 gliomata and 34 sarcomata; above twenty years in comparison with only 41 tubercles, we have 54 gliomata, 86 sarcomata and 25 gliosarcomata. With regard to tuberculosis of the meninges, in 161 cases Boltz found it 64 times against 18 cases of solitary tubercle; Schwer observed 83 meningites and 21 solitary tubercles. In the 490 cases of Plambeck, 62 times, that is to say in 12.6 per cent. there was tuberculosis of the meninges, while the solitary tubercle only represented 1.8 per cent. Hamann, in 346 cases, found 15 solitary tubercles (4.3 per cent.) and 37 tuberculous meningites (10.7 per cent.).

But a still more important fact is that the tuberculous meningitis coexists often with the tubercle. In Boltz's 18 cases, 15 showed also tuberculous meningitis. Nothnagel⁶⁷ also remarks that the association of a solitary tubercle and of a tuberculous meningitis is a very frequent fact: in 16 cases of solitary tubercles, Simmonds found tuberculous meningitis in association with it ten times. In Eulenberg's⁶⁸ statistics, in 148 cases, 38 times there was coexistence of meningitis. Trevelyan⁶⁹ reports 33 cases of solitary tubercle in 114; and of these 33 there were 23 with meningitis.

In consequence, we may say, that, especially in children, in about 73 per cent. of the cases the solitary tubercle is associated with the tuberculous meningitis that is to say three or four times oftener than it is found isolated.

With respect to the regions of the brain attacked, Allen Starr's statistics give the greatest frequency in the cerebral axis (70), above all in the pons, in the ganglia of the base, in the quadrigeminal tubercles and in the peduncles, after that in the cerebellum (55) while in the cerebral cortex and in the

oval centre they give only 22 and 8 respectively. The figures in Eulenberg's Encyclopedia give 66 cases in the cerebral axis (especially in the pons, in corpora striata, and the optic layers) 55 in the cerebellum, and 51 in the cortex. A second set of statistics gives in 108 cases of solitary tubercle, 36 in the cerebellum, 34 in the cerebral axis and 7 in the cortex. Nothnagel and Gerhardt⁷⁰ also give the cerebellum as the seat preferred, in Trevelyan's cases the order of frequency is the cerebellum, the pons, the peduncles, and then the cortex. Another very important fact for us is the frequency with which, despite its name, the solitary tubercle is multiple. In Allen Starr's statistics which we have already quoted many times, multiple tuberculomes are noted 34 times in 152 cases under twenty years, and 4 times (in 41 cases) in adults. In Eulenberg's statistics in 148 cases, 67 are really solitary tubercles, while 81 cases were multiple. In the 33 cases reported by Trevelyan 17 were multiple. In general we find 2, 3, sometimes 4; but there are other cases in which we meet with many more. Homen,⁷¹ West,⁷² Hensch⁷³ mention 12, Middleton⁷⁴ found as many as 24, whose size varied from that of a pea to that of a hazel nut, and which were scattered in the grey substance of the frontal, parietal and occipital lobes and in the cerebellum, and it is to be noted that there were no symptoms during life.

From all that precedes certain points have been determined, which are of capital importance for the subject of surgical intervention.

The most frequent occurrence is in children; compared with other varieties it is the tubercle that is in their case the commonest cerebral tumor. It is also in the child that we most frequently meet the multiple tubercle, very frequently accompanied by more or less diffuse meningitis.

In adults, on the contrary, it is relatively rarer and, besides, very often single and without complications.

Further in children, as in adults, the seat of the tubercles, simple or not, is often in difficultly accessible regions of the brain.

Apart from what precedes we have to consider also the two other following facts:

(a) The coexistence in the organism of other tuberculous lesions whose presence counterindicates any intervention.

(b) The possibility of a spontaneous healing without surgical aid.

(a) As to the first point it is well known that the ordinary tuberculoses of the meninges are nearly always secondary to other foci in the organism. We find oftenest tuberculous lesions, whether old or recent, in the glands, above all the peribronchial and mesenteric, in the lungs, sometimes in other viscera, in the bones, the joints, etc.

One may also have a diffusion of the tuberculous process through continuity (caries of the bones of the cranium, lesions of the nasopharynx, of the middle ear, etc.). According to Heller,⁷⁵ one can never have, especially in children, a direct infection through the lymphatic vessels by the nasal cavities (primitive cases?). In 44 observations on solitary tubercles, Hale White reports that there have always been other localisations of tuberculosis in the organism; only in 5 cases, was a single organ attacked and in 4 two were attacked; in the other cases, 3, 4, 5 organs or apparatuses were affected, and even more sometimes. In Trevelyan's 114 cases, only six showed no other foci; but the autopsies were incomplete.

Evidently in the case of generalised tuberculosis or of very diffuse and advanced tuberculous lesion—even of a single apparatus (respiratory, digestive, etc), it is vain to think of surgical intervention for the cerebral lesion, which, in such cases, passes into the second line. Of the 9 cases, out of Hale White's 45, cited above, that had limited foci in the other parts of the organism 1 case had multiple tubercle; in another the seat of the tuberculome was the pons. Of the other 7, one was accompanied by meningitis of the base, 3 were very diffuse.

We must recognize that these statistics are very discouraging.

(b) The possibility of healing of solitary tubercles is nowadays strengthened by many observations, and many researches have been made as to the manner in which this healing is effected.

The tuberculous conglomerate, really a mass of miliary

tubercles, can, on developing, attain a size varying generally between that of a green pea and that of a pigeon's egg. Some even larger have been reported. Jackson says he found one as large as a billiard ball in the cerebellum of a child of five years; Arnot found four as large as a hen's egg in the cerebrum of a child of four years and a half; Nothnagel, as large as a duck's egg, Trevelyan as large as an orange and even larger. The one Czerny extirpated weighed 205 grammes, that of Knapp and Bradford 63, that of Krönlein was as large as a fowl's egg, those of Roux and Terrier as large as mandarin oranges. Durante mentions two in the same individual, of which one weighed 30 grammes, the other 40; the one I extirpated myself was as large as a little nut.

The cheesy degeneration, above all in the centre, is ordinarily very early and its limitation by cerebral substance is also more or less definite; we often find all round a certain extension of hyperæmia and vascular development or a zone of tissue of granulations which can be sometimes transformed into a real capsule of compact fibrous tissue. In this case it is evident there is a tendency to incapsulation and sometimes to calcification which leads to a cure.

Treyer⁷⁶ reminds us that Wernicke, Gowers, Knapp, Starr, Baginsky, Sternberg, Sahli and others report cures of this class; and the greater part took place after treatment with strong doses of potassium iodide. Bruns equally affirms, that Gowers obtained cures with potassium iodide, codliver oil, iron, country air, etc.

Certainly, in such cases cure is notwithstanding always relative, and we must before all things exclude a syphilitic lesion.

In two cases he reports, Trevelyan found a fibrous centre and a calcareous mass that one might consider as healed tubercles. In one case Williamson⁷⁷ met with a little yellowish mass; in another, Ashby⁷⁸ found a little cyst with earthy walls; Bristowe,⁷⁹ in a third case, a hard mass in the cerebellum. In all three cases there was death from tuberculosis and afterwards other tuberculous masses were found in the brain. In a case reported by Kahlmeyer⁸⁰ there was a scar with yellowish striæ in the cerebellum of a woman who eleven

years before, had presented phenomena of disease of cerebellum; the woman was consumptive; there was no syphilis. Oppenheim⁸¹ reports the case of Siemon, in which the autopsy discovered in the brain an old tubercle, at first caseified, and afterwards ossified. When alive, the individual was hemiplegic and an idiot. Winkler⁸² presents a case operated by Guldenarm, in which he found in the central circonvolutions, where he extirpated it, a calcified tumor of strange form, like a segment of a sphere whose chord would be $3\frac{1}{2}$ centimetres. Its weight was twelve grammes and a membrane prolonging itself across the cortex put it in communication with the pia mater. After having decalcified it they found it enveloped by two membranes one thick and of connective tissue, the other of granulation tissue. These two membranes covered a centre formed of calcified detritus. The case mentioned by Foa⁸³ is also very important. He found in the cerebellum a nodus of fibrous, almost tendinous aspect, with irregular edges; in the centre two little yellowish foci, thick, of cheesy appearance: there were also lesions of the dura mater and of the soft meninges, demonstrating an old meningitis cured.

From what precedes we can then consider some cases as certain; others on the contrary are very doubtful and we can hardly speak of true cure; without considering that for the brain and especially for certain regions of this last, as we shall see further on, the tubercles even if they become incapsulated or are calcified always represent a lesion with grave functional symptoms. The mode of healing is rather a question of pathological histology, and although interesting, to be shorter, I shall speak of it in passing. I will mention, however, the interesting experimental researches of Barbacci⁶⁴: He, in the struggle against bacilli, attaches the greatest importance to the fixed elements but especially to the mobile elements, first the polynucleated, then the mononucleated and to the calcification of the focus. Let me notice also the observations of Roncali⁶⁵ on the case operated upon by Durante. These observations support the possibility of a connective fibrous transformation. This commences, it seems, in the central part of the nodus, particularly under the action of the elements of immigration around tubercles which are evidently in course of involution.

In one case which I myself operated, I remarked rather a tendency to capsulation of the process by development of a connective fibrillous tissue at the periphery of the tumor, this tissue was, at certain points of adult fibrous type; this connective neoformation was not uniformly developed at all points; in the inferior section of the tuberculome, it was not clearly limited by the cerebral substance, one even saw histologically the gradual passage of the typical tuberculous granulation into the nervous tissue, accompanied by abundant parvicular infiltration.

The results I have attempted to put together up to now lead us to the following conclusion: there can be a question of surgical intervention in only a small number of cases even when it is a matter of limited tuberculous lesions of the brain.

And this by reason of, specially, the ordinary site of the tubercles, the frequent complication with meningitis, their multiplicity, the presence of other serious tuberculous lesions in other organs of the body.

Relative to intervention the possibility of spontaneous healing has an importance which varies according to the point of view under which we consider it. In effect, if in some inaccessible regions and in case of multiplicity of tubercles, the possibility of healing has to be thought of for medical treatment, surgical intervention can not be excluded for the regions where it is possible, since a tuberculous conglomerate may occasion very serious functional derangements even if this conglomerate is capsulated and stationary. More, it may encourage to surgical action even in the possible hypothesis of other similar cerebral foci, in other silent seats.

In any case to allow of intervention the essential point is that we can diagnose with precision the seat of the lesion, and it goes without saying that this must be surgically accessible.

What precedes concerns as much the tubercle as any other cerebral tumor, and the question being well known and very common it need not delay us in our special report. Several authors have related cases of tubercles of the pons, of the quadrigeminal corpora, of the cerebral peduncles, in which symptomatology allowed the seat of the lesion to be deter-

mined, but in which there was evidently no possibility of surgical action.

It is evident that in this connection possibility of establishing exactly the seat of the lesion will present itself first to the Rolandic region; secondly and in a few cases for the tubercles of the cerebellum, for the frontal lobes, sometimes for the occipital and sphenotemporal (visual and auditory centres). It is often even much more difficult to determine if the lesion is meningeal, cortical or deep seated. For the psychomotor centres themselves the presence or the absence of epileptiform attacks accompanied, or not, by persistent pareses and their clonic or tonic character are not sufficient to allow us to diagnose the seat of the process in the meninges or in the cortex. So also in the case of cephalalgia and local heat mentioned by some. Cranial percussion both in its timbre and in the pain it causes is without gainsaying very important; MacEwen and Bruns insist on this. De Paoli⁸⁷ has made important researches with regard to this subject. Durante has proved its value in many cases; but it is not always certain. In my case, for example, the percussion and the pain led to the probable diagnosis of a lesion of the meninges while the dura mater was perfectly normal, not adherent, and the cortical focus rather deep.

When we have established the seat of an organic lesion and this seat is accessible with regard to our subject we could here put two questions:

1.—Is it possible also to diagnose the nature?

2.—And if we diagnose tuberculous tumor would that dissuade us from intervention?

In general diagnosis of nature is always very difficult.

In the particular case of tuberculosis, apart from the age, the hereditary antecedents, and the general constitution of the subject (data always uncertain) an important argument is from the presence of other tuberculous foci in the organism: most often in the lungs, in the lymphatic ganglia, in the bones or articulations.

Several consider the examination of the ocular cavity (tubercles in the choroid) as decisive: now since the positive discovery has for its special characteristic a meningitic dif-

fusion, it is evident on this account that this discovery cannot have place in the typical cases of solitary tubercle, which are just the cases susceptible of surgical operation and one cannot have the discovery of a simple papilla of stasis (especially in circumscribed lesions) or, if it exists, it indicates nothing except an endocranial compression, whose nature it does not inform us of.

Increases of temperature at sunset, above all if coincident with the attacks, may on the contrary give us a probability. It goes without saying that we should not be able to attribute them to other causes or to other foci existing in the organism.

The same thing may be said of the injection of tuberculin; it may indeed indicate to us tuberculosis in the organism, but the lesion may exist in other organs. See the communication of Dupont⁸⁸ to the International Congress of 1900.

The diagnosis of the nature cannot be made then, or it will be rested upon probability in a few cases.

That, however, does not exclude intervention. And before everything for the good reason that even if it were demonstrated that in presence of tubercles it is better not to intervene, the uncertainty of the diagnosis should not stop us in other processes in which, given the clear symptom, intervention may be useful.

In the second place because while taking into account all the difficulties and the data mentioned above, the majority admit to-day that the tubercle is susceptible of extirpation and of cure. And statistics confirm this.

Bergmann⁸⁹ himself who is considered opposed to intervention, says merely that he does not wish to enter into the question of operation or non-intervention in the case of tubercles, especially of those of the cerebellum, but adds when the operation shows there is a tuberculous tumor it must always be removed. Now as it is generally so (the diagnosis of nature being only possible approximatively), we can say we are all agreed upon the practical indication of intervention in cerebral tubercles, provided it is indicated by the following conditions: precise diagnosis of the seat, accessible region, absence of signs of multiple or diffuse lesions, general satisfactory condition of the subject.

It is not my part here to enter into technical details which do not differ from those in the case of cerebral tumors generally.

Oftenest, the tuberculome can be removed easily thanks to the sufficiently exact limitation one finds in the greatest number of cases: we have often succeeded in extirpating them with a blunt instrument, or with the finger; seldom with the sharp knife or the spoon.

I will rather report the statistic data important for our purpose, since they teach us what has been done up to date, as well as the results obtained; they may also encourage us to greater boldness and to better hopes.

In the statistics I only include cases in which the tubercle was found on operation and removed.

The first sets of statistics of Chipault⁹⁰ and Bergmann⁹¹ report respectively 9 cases, the first, and 8, the second, for the cerebrum and 3 and 4 for the cerebellum.

Auvray⁹² adds another case.

Treyer⁹³ when repeating them summarized the cases already published and added two new ones from Roux.

So, altogether, deducting the operations unsuccessful or palliative, he has put together 16 cases of operations upon solitary tubercles in the brain (12 in the cerebrum and 4 in the cerebellum).

In one case however (obs. xi of Macewen) it is very doubtful if it was tuberculosis. He reports, besides, 10 cases where the intervention was ineffectual whilst the autopsy showed one or even several tubercles whose position varied. Amongst these last, one of the cerebellum (Parry's case) must be included in the first series because the tubercle was partially removed.

There were then 12 cases operated for the cerebrum, and 5 for the cerebellum. Krönlein⁹⁴ at the Thirtieth Congress of the German Surgical Society (April 1901) reporting on the man operated by him in 1895 who was still living, repeated Treyer's statistics.

Duret⁹⁵ reports 16 cases of the brain but, amongst them, he includes the case of Andrenoud, in which nothing was found at the operation.

Of the other 15, 12 were already reported in the preceding statistics; the three new ones are the cases of Bayerthal, of Lunz and Heidenhain. But Bayerthal's case and Heidenhain's are the same, the case was operated by Heidenhain and published by Bayerthal, his assistant; afterwards Heidenhain himself communicated it to the German Congress of Surgery.

There are then really 14 cases.

On the other hand, he omits the two cases reported by Sick⁹⁶ and Schnitzler,⁹⁷ which make 16 cases.

For the cerebellum he reports 7, of which 3 are already included in Treyer's statistics, and that of Parry, reported by Treyer erroneously among the unfruitful operations; but we must subtract Terrier's case, reported even by Treyer, and the other two of Jaboulay and Descot, and of Okynzic-Tuffier, in which the tuberculous tumor was not found in the operation. On the contrary I think the case of Tuffier I reported in the first part of the report can be included in the statistics.

To resume there have been 17 cases of the cerebrum and 4 of the cerebellum. To these we must add the case of Collins and Brewer, reported by Treyer.

Further we may report the Italian statistics. In Italy 6 interventions for tubercles of the cerebrum and 3 for the cerebellum have been published. The cerebral interventions are those of Tassi,⁹⁸ Poli,⁹⁹ De Paoli,¹⁰⁰ Bendandi,¹⁰¹ Durante¹⁰² and Alessandri,¹⁰³ those of the cerebellum are those of Lampiasi^{104,105} and Nota.¹⁰⁶

I résumé here the results:—In operating, the tuberculous lesion was not found either in the case of Poli (it was in the left cerebral peduncle), nor in the case of Bendandi, (two tubercles at the external and posterior part of the third temporal of both sides). Amongst the cerebellous tubercles, the first case of Lampiasi is that which Treyer and others report very inaccurately; the tumor was not discovered at the operation. In the second case, on the contrary, the tumor was found and extirpated. In Nota's case the operation was also unfruitful.

We must then only add to the statistics above given 4 cases of cerebral tuberculosis and 1 of tuberculosis of the cerebellum. In all, 22 cases of operation for the cerebrum and 6

for the cerebellum. In his last collection Chipault ¹⁰⁷ mentions two other cases in which he only made some quite simple decompressive trepannings without finding the tumor which was discovered at the autopsy, in one of the cases they found a tubercle in each of the hemispheres of the cerebellum, and in the other they discovered a large plaque of cheesy meningitis in the right frontal region. It is also necessary to mention in passing, without including it in our statistics, the case of Fison and Luckham,¹⁰⁸ that is to say of a young man of 16, in which death took place before the end of the trepanning; at the autopsy a tubercle was found in the left lobe of the cerebellum.

I think on the contrary that it is necessary to add to the statistics the case of Winkler and Guldenarm mentioned above.

So that the cases operated, in which on operation the tuberculous lesion was discovered and removed either entirely or partially are 21 for the cerebrum and 6 for the cerebellum.

See in the tables (pp. 169 and 170) their most important details.

In conclusion, given the limitations to indication for operating I have spoken of above, the results are fairly good for the cerebrum. In 22 cases operated the result of the operation was favorable in 19; it is true we must add that, in some of these cases, the amelioration was very little or none at all. In several cases treated by surgical intervention, there was death following more or less closely, whether through multiple tubercules or through meningitic diffusion of the process. But in others the good result continued long enough and has probably lasted. We have in fact reports of the good health of the patients operated by Macewen (after eight months), by Horsley (after six years), by Czerny (during four years), by Krönlein (after six years), by Roux (after about three years, and after five months), by Alessandri (now after more than a year).

The statistics of tuberculoses of the cerebellum are, on the contrary, more discouraging: in fact, in 6 cases in which we have been able to find a lesion and to remove it by means of the operation, 4 cases were immediately followed by death and two others had only a transitory amelioration since death took place after two months and a half in the one case and after

ten months in the most favorable case (Macewen). What precedes seems then to justify the idea of Bergmann who advises against intervention in cases of tuberculosis of the cerebellum.

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THE ELASTIC LIGATURE AND THE LIGATURE METHOD.¹

HISTORICAL AND EXPERIMENTAL DATA FROM THE SURGICAL
LABORATORY OF THE MEDICAL DEPARTMENT OF THE
UNIVERSITY OF CALIFORNIA.

BY DUDLEY TAIT,
OF SAN FRANCISCO, CAL.

THE paucity of accurate data concerning the history of the elastic ligature has prompted the present communication, in which the topic is also viewed from the standpoint of experimentation. No claim to originality is made, in view of the conceded threadbare condition of the subject to which the experiments relate: gastric and intestinal suture. To an Italian surgeon, Grandesso Silvestri, of Vicence, we owe the first published reference to and experimental study of the elastic ligature (1862). A year later, Richard, acting upon Prof. Trousseau's advice, used the elastic ligature in various cases, 17 in all (vascular growths, tumors of the breast, fistulæ in ano, etc.), and reported the results in a brief memoir (1863). Subsequently (1865) two English surgeons, Bryant and Henry Lee, resorted to this method for the removal of lipomata, hemorrhoids and pediculated growths, and in 1871 Henry Lee reported to the London Clinical Society an ablation of the tongue by means of the elastic ligature.

The same year Grandesso Silvestri published a second memoir on the subject, confirming and completing his original conclusions.

The above mentioned trials passed almost unnoticed. Hence Dittel's announcement of the discovery of the elastic ligature before the Medical Society of Vienna, 1873. His attention had been drawn to the possibilities of this method of treatment by the following very curious incident:

¹ Read before the San Francisco County Medical Society, Oct. 11, 1904.

On the 5th of March, 1872, a girl, aged 11 years, was admitted to the hospital for marked headache. Examination showed a suppurating wound encircling the entire head and containing an elastic cord which was forthwith removed. According to the patient's statement, she had often been severely punished by her mother-in-law for the untidy condition of her hair, and had sought long ago to avoid further chastisement by continuously wearing a net with an elastic cord stretched tightly around the head, thus preventing the displacement of the net. Symptoms of meningitis appeared at an early date, death occurring March 21st. The necropsy showed section of the soft parts and of the bones of the skull, as if made by a fine saw. With the exception of a few trabeculæ, the section of the cranium was complete.

Encouraged by this demonstration, Dittel immediately applied the elastic ligature in over 200 cases: Erectile tumors, anal fistulæ, ablation of cancer of the breast, ligation of vessels, prolapsus ani, phymosis, castration and amputation of the lower limb. Thus Dittel's contribution to the elastic ligature brought the method into prominence. Nevertheless, the priority belongs to Grandesso Silvestri. Even Dittel himself (Oct. 7, 1873), with very commendable loyalty, publicly acknowledged the justice of Silvestri's claims. Contemporary German writers, for reasons unknown, fail to mention the latter incident.

Grandesso Silvestri used the elastic ligature in lateral intestinal anastomosis, but, finding it unsatisfactory, discarded it immediately. Gaston of Atlanta (1884), was the first to employ the ligature method for the establishment of a channel of communication between hollow viscera. His cholecystoduodenostomies by this method were not satisfactory, however, and Gaston voiced his preference for the suture method.

Shortly afterwards (1888) Bardenheuer reported a series of intestinal anastomoses with a round rubber cord, 1 to 1.5 mm. in diameter, forming a chain ligature. In 1891 McGraw published his first address on the elastic ligature, simplifying Bardenheuer's technique but retaining the latter's round rubber ligature material.

Although ably and adroitly presented, the cause of the elastic ligature failed to make converts, and was soon abandoned by its chief advocate.

Then followed a series of researches by Russian sur-

geons. Podres (1898) used two silk ligatures in the shape of a cross, thus obtaining a star shaped opening within four days. Podres applied this method in two patients. The result in one case was excellent; the second patient died on the sixteenth day. Sokoloff, using the same method, reported three gastro-enterostomies with two failures to cut out.

After several similar failures Podres modified his method by circumscribing a rectangular area 4x6 cm. by means of four silk ligatures traversing all the gastric and intestinal layers. Schalita, Sokoloff, Varnex and Tedoroff (1899) reported numerous gastric anastomoses by this method, but the results failed to convince other Russian or the Continental surgeons. Porta (1899) modified McGraw's technique by using a rubber band and Raffa further complicated the question with two elastic ligatures. Modlinski (1899) substituted rubber for silk in Podres' method. In 1892 Postnikow proposed an oval excision of the seromuscular layers of the stomach and intestine, followed by ligation of the protruding mucosa.* Trojanoff (1893) and Lauenstein (1894) each reported a success in men with this method. Mugnai, a year earlier, had used the thermocautery instead of the knife, prior to ligating the mucosa.

In 1901 McGraw reiterated his statements regarding the elastic ligature, and reported a series of successful trials with what he calls "a method of my own invention" (N. Y. Med. Jour. 1901, p. 133). While McGraw is in no sense the originator of the elastic ligature, he nevertheless deserves unstinted praise for having rejuvenated, made practical and ably advocated this very interesting question of operative technique.

ELASTIC LIGATURE.

Size of the Elastic Ligature.—While the round rubber ligature used by Bardenheuer measured only 1.5 mm. in diameter, that employed by McGraw measured 3 to 5 mm. Our experiments on large dogs, and seven cases in man, proved conclusively the superiority of a much smaller size. The flat rubber bands 1 to 2 mm. in width, as are commonly found in

* This procedure was recently recreated by R. C. Coffey, of Portland, Ore. (Medical News, Nov. 4, 1905.)

stationary stores, gave excellent results in intestinal anastomoses.

Quality of Rubber.—Pure rubber, capable of being stretched at least five times its length, should be selected.

The usual rectangular mode of placing the elastic ligature is the quickest and safest. All other methods make irregular and small cut-outs.

The plan of punching out a stoma originated with Bardenheuer (rubber-chain ligature). Podres sought to obtain the same effect by using silk ligature in triangles and squares.

Subsequently the problem received some attention from C. M. Cooper, of San Francisco, and later from Weir and Maury, of New York, who recently disinterred the old method of Podres, rendering it still more complicated. In view of studying the merits of the punching-out plan, a large number of intestinal anastomoses were made with rubber, silk and twine, enclosing areas of diverse shapes—squares, rectangles, Greek stars, single and double triangles. The results showed a high mortality whenever the simple rectangular method was departed from and the rubber openings were invariably the most satisfactory. All anastomotic openings eventually become oval or circular.

The mode of securing the knot suggested to McGraw by Hickey is, at best, a clumsy device. The more recent mode of tying the rubber with silk or thread is merely a modification of the procedure employed years ago by Sir Henry Thompson (1874). A simpler and equally safe method is to place a clamp on the rubber strands previously drawn taught; a silk ligature can then be placed beneath the clamp, the rubber cut short and the clamp removed without fear of the knot slipping.

In a series of over 150 operations, comprising 12 different interventions on the stomach, intestine, gall-bladder and urinary bladder, rubber cord, 3 mm. in diameter and flat rubber bands 1 to 2 mm. in width and 1 mm. in thickness were used, with the ordinary or the Reverdin needle.

The time necessary for the elastic ligature to cut through, varied considerably. However, with a fixed degree of constriction the time required for the cut-out is directly propor-

tionate to the amount of tissue in the bight of the knot. This fact is well illustrated in Bardenheuer's method of gastro-enterostomy by elastic chain ligatures in which the cut-out takes place within two days.

The shortest time noted in any of the dogs was three days for the intestine and four days for the stomach. In the majority of dogs the cut-out took place in four days (stomach) and three days (intestine); in the early experiments, more time was required with cats (four to six days), but later the constriction was more properly made and the results resembled those obtained in dogs. Variations in the time of the cut-out may be partly due to the quality of rubber. Old or boiled rubber may lose much of its elasticity. The degree of constriction is undoubtedly the principal and most important factor.

In estimating results, the intestine will be considered independently of the stomach.

Intestine.—The following sufficiently accurate mode of comparison was adopted:

1st, A series (5, 6, 7,) of lateral anastomoses were made at the same séance by the rectangular-ligature method with various materials,—rubber, silk, twine, plain and chromic gut, of various sizes.

2d, Several lateral anastomoses by the various suture methods,—the two-row suture, the continuous or interrupted Connell suture.

Necropsy specimens of a large series of these experiments show:

1st, A considerable number of failures to cut-out when No. 1 catgut and No. 1 silk are used.

2d, A few failures with linen thread of silk No. 2 and 3.

3d, No failure with properly placed rubber.

4th, In one instance the rubber (1x1 mm.) was found encysted, having evidently broken.

5th, The size and shape of the anastomotic opening were somewhat influenced by the nature of the ligature material. The opening produced by rubber exceeds all others in the transverse and longitudinal diameters.

6th, In *successful* intestinal anatomoses, the cut-out re-

quired more time with rubber than with any of the other materials, all of which could be handled more expeditiously and with a greater degree of immediate sero-serous approximation than rubber. The only somewhat bulky knot was that of rubber.

7th, The puckering of the gut produced by the ligature sometimes persists more than thirty days. This is particularly noticeable in intestinal anastomoses measuring more than 5 cm. In these cases the opening is seldom clean cut; on either side and in the middle third of the opening an elevated granulating fold will be frequently found as late as the fourteenth day.

This is more or less present at an early date in all methods of intestinal anastomosis. The elimination of the protruding parts between the two flaps of mucosa takes place by necrosis or by the destroying power of those crypts which have returned to their embryonic type (Mall).

8th, The stoma made with rubber can always be recognized; it is large, clean cut, and has a sharp, regular edge. The Connell stitch produces a much shorter and narrower stoma, owing to the constant presence of a bridge formed by the protruding intestinal layers. Regeneration of the mucosa is somewhat slower than with the elastic ligature.

9th, The classic two-row suture method makes a stoma comparing favorably in width and length with that made by rubber. It is, however, generally less regular in outline. Furthermore, regeneration of the mucosa requires more time, and omental adhesions are more pronounced than in both of the above methods of anastomosis.

No apparent contraction was noted in elastic ligature openings after a period of twelve and sixteen months.*

* The observations of the Mayo Brothers regarding the closure of the anastomotic opening in cases of patulous pylorus were not substantiated in any of the dogs operated on and kept under observation for several months. Furthermore, the findings of the French, German and Swiss schools (Terrier, Hartmann, Montprofit, Kocher, Witzel and Roux) do not corroborate the Mayos' assertion. The occurrence of this complication in the Mayos' early cases suggests the presence of slight local peritonitis due to over-manipulation or possibly faulty suturing, causing an inordinate amount of granulation tissue.

The *modus operandi* of a successful anastomosis by the ligature method is conclusively illustrated by the inspection of the parts immediately after the operation. It will be noticed, first, on the peritoneal surface of the bowel, that the ligature material (silk or twine) has cut through the serous and mucous layer and the major portion of the muscular layers, leaving merely a few circular muscular fibres and some submucosa; second, on the mucous surface of the bowel, when the ligature fails to cut through the muscular layer, the submucosa retains its vascular supply, and consequently does not undergo necrosis. It would seem, therefore, that the bridges of tissue in the anastomotic opening, noted by all experimenters, are in part due to insufficient or irregular constriction of the parts involved. In other cases of totally inadequate constriction, the mucous surfaces show, after eight days, a lineal scar of variable depth, when catgut is used, or two minute orifices, surrounded by scar tissue, in which the silk or twine (rectangular) ligature hangs loosely.

In view of the immediate destruction of the various intestinal layers by the use of the ligature method (silk or twine), several attempts were made to obtain an anastomotic opening by removing the ligature and then circumscribing the entire previously ligated area with Lembert sutures. Failure followed in all cases. A certain amount of necrosis occurs, but a lineal cicatrix will be found as early as the sixth day. Microscopic sections of specimens of one hour, one and two days, proved conclusively the impossibility of securing anastomosis by this method. Mention is made of these negative results in view of the recent erroneous statements of Werelius (J. A. M. A., 1904).

Stomach.—Rubber cord, 2 or 3 mm. in diameter, placed in the usual rectangular manner, never failed to cut-out. In all cases inspected during the first and second days the pyloric end of the stomach seemed to be in a state of contraction. This condition was not present on the third day. Dilatation of the stomach was present in a few cases during the first and second days.

For comparative purposes, ten dogs and six cats were sub-

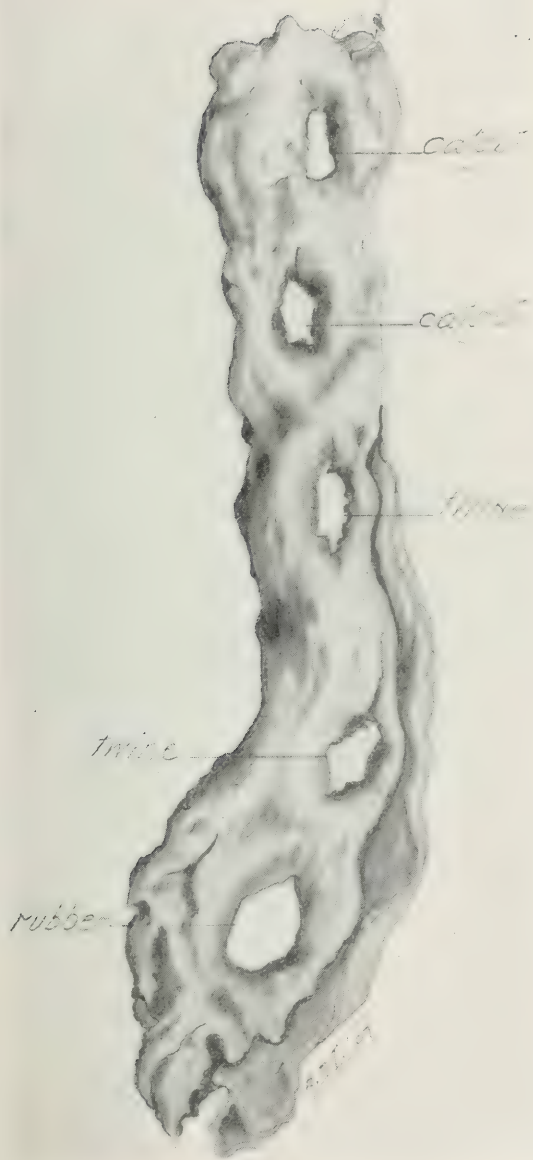


FIG. 1.—Natural Size.



FIG. 2.—Natural Size.



FIG. 3.—Rubber—15 days.

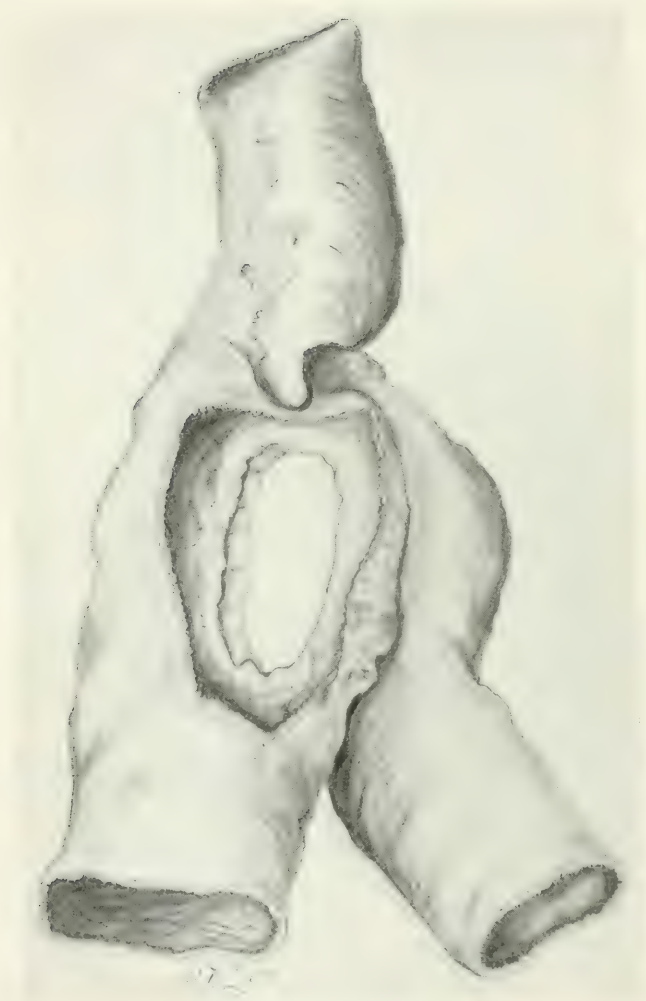


FIG. 4.—Two-row Suture (10 days.)

jected to a gastroduodenostomy* (Villard, Kocher) and simultaneously to a posterior gastro-enterostomy. Rubber, in rectangle, was used for one operation; and twine, in triangles, for the other. The results were uniform. Aside from being far less expeditious, twine in triangles proved less safe, more bloody, necessitated more extensive sero-serous suturing, caused more pronounced and more lasting kinking of the gut and more irregularly shaped and no larger openings than the elastic ligature used in the usual rectangular manner. Failure to cut-out was occasionally noted with twine.

We feel, therefore, justified in condemning all attempts to render difficult and dangerous a very simple and safe procedure.

In view of studying the degree of shock resulting from the use of the ligature method, the following operations were performed at one séance on a pregnant slut: 1 gastro-enterostomy, and 2 entero-enterostomies. Evidence of pain during the first 36 hours was the only noticeable feature;—the animal ran about as usual on and after the third day, and gave birth to five pups of normal size on the seventh day.

The following was done on a male dog: 1 cholecysto-gastro-enterostomy, and 4 lateral anastomoses.

In a third case eight lateral anastomoses were made. These dogs remained without food for two days, then gradually resumed their normal state and were subsequently re-operated, in one case as many as six times. Anastomosis made under local anesthesia caused very marked pain when twine or silk was tied in triangles or squares. With rubber, in rectangle, pain was much less apparent.†

Speed.—The ligature (intestinal) can be placed, tied and cut within fifteen seconds, and an additional anterior supporting mattress suture requires about the same length of time.

A series of over fifty ligature operations (catgut, silk) show that protecting sutures are not indispensable in intestinal anastomosis. Under these circumstances omental adhesions were seldom noticed, and in cases of reoperation after thirty

* Finney's operation can be done with the elastic ligature, but failures are not infrequent.

† Halsted and Mall noticed that sero-serous union frequently took place before the operation was completed.

days none was found. The posterior row of protecting sutures is entirely superfluous in view of the perfect sero-serous approximation, and the sole purpose of the anterior suture is to cover an immoderately large knot. Microscopic sections show clearly the advantages of protective sutures when rubber is used, although they may be dispensed with, as proved by a long list of successful gastric anastomoses in the dog. However, when considerable tissue is included in the bight of the ligature supporting sutures are in order. Under such circumstances a posterior row and a single anterior mattress suture will prove expeditious and thoroughly adequate.

These facts are rather significant when we recall Gregory Connell's loud utterances relative to the "knot within the bowel," a feature which made but little impression on experienced American surgeons and none at all on foreign surgeons. As early as 1889 Chaput proved the absence of ill results from through and through intestinal sutures with the knot outside of the bowel, and subsequently Sonnenberg advocated and successfully practiced a similar method in appendicectomy.*

Convinced of the reliability of the results of experimental findings in the question of supporting sutures, we made (Aug., 1904) a lateral anastomosis in the pelvic colon in order to circumvent the consequences of a kink following the resection of a sarcoma of the bowel. Braided silk was used in the usual rectangular mode, and a single narrow mattress catgut suture sufficed to cover the knot. Immediate and final results were perfect; no peritoneal reaction was noted. The patient passed gas the first day and had a large formed evacuation of the bowels the sixth day. Having eleven months previously made a lateral anastomosis in this patient by the two-row suture method, we were able to appreciate the simplicity of the ligature method.

The claim that union by first intention occurs with the elastic ligature in gastro-intestinal anastomosis is most easily disproved by the very elementary consideration of pressure

* It is not commonly known that the essential part of the so-called Connell suture—the through and through continuous stitch—is due to M. E. Connell (1888). Gregory Connell modified his father's suture by placing the knot within the lumen of the gut.



FIG. 5.—Twine (rectangular).



FIG. 6.—Gastro-duodenostomy and Gastro-enterostomy.

necrosis in a septic medium like the intestinal canal. Furthermore, microscopic sections of ligature specimens of two to three weeks, frequently show a marked gap of granulation tissue between the gastric and intestinal epithelial borders.

Again, it is stated that there is no escape of feces and therefore no exposure to peritoneal infection from the bowel contents. Inspection of the portion of the ligature which has traversed the bowel will invariably show the presence of feces in the unprepared cases, and culture tubes inoculated with the rubber in question always give a luxuriant growth of bacteria in the prepared cases. It may, therefore, be safely asserted a priori that asepsis neither exists during nor after an operation with the elastic ligature.

Circular Ligature.—The results of circular ligature in the intestine were first noted in the clinical studies of several French surgeons, Quénu, in particular, and their findings were confirmed experimentally by Genersich, in Germany, and by my clever friend, J. Henry Barbat, of San Francisco.

The results vary according to the condition of the bowel; in cats previously purged or starved for twenty-four hours, a tight ligature causes a necrotic process similar to that described in lateral anastomosis by the ligature method. The serosa completely covers the ligature within 36 hours, and on or about the fifth day the ligature passes into the intestine, the lumen of which becomes pervious as early as the 9th day. When the ligature was left loose, it remained *in situ*, and always failed to pass into the gut, death occurring from inanition sometimes as late as the nineteenth day. No signs of ileus or peritonitis were noticed in either of the two foregoing groups of experiments. In unprepared animals early death from toxemia frequently resulted. No peritonitis was present at necropsy.

The preceding statements were verified by three varieties of experiments:

1st, A ligature (silk or rubber) was placed on the afferent loop in von Hacker's gastro-enterostomy with entero-enterostomy.

2d, Lateral anastomosis between the ileum and pelvic colon with ligature on distal end of ileum (Barbat).

3d, Circular ligature on the small intestine (Genersich),

or colon. Specimens from all three varieties of cases show the lumen of the gut almost normal in diameter with a lineal scar plainly apparent beneath the serous coat.

In the domain of vascular anastomosis the ligature method proved very serviceable (Eck's fistula and Carrel's anastomosis between the carotid artery and jugular vein).

While our clinical experience* does not permit us to speak authoritatively on the indications of the use of the ligature method, a few facts may nevertheless be deduced from animal experimentation and an extensive study of the published clinical cases.

The *ligature anastomosis* is the quickest to make and the slowest to functionate. Hence, we should never resort to this method when an immediate effect is required. *Its field of usefulness is unquestionably in the various lateral intestinal anastomoses. Here the ligature method may become the method of choice.* Its adoption may be of service in the following conditions: Strangulated hernia, artificial anus, inoperable obstructive tumors of the intestine, as a preliminary step in the resection (Kocher) of large intestinal neoplasms.

In certain gastric conditions (incomplete pyloric stenosis, inveterate dyspepsia, ulceration) the elastic ligature may prove of service, but we should not overlook the fact that in these conditions the suture method in the hands of experienced men has proved eminently safe and satisfactory.

In incomplete malignant pyloric stenosis, the elastic method may prove useful at an early stage, but in late cases feeding cannot be retarded, and acute dilatation may prove dangerous. Not the least of the objections to the ligature method are the tendency to do a palliative operation rather than a radical or curative one and the frequent abuse of an apparently simple operative method.

The perusal of the published reports of the elastic ligature demonstrates the absurd use made of the method, especially in this country, for complete pyloric obstruction of benign or malignant origin. It were indeed truly difficult to preconize

* Our elastic ligature operations in man comprise three posterior gastro-enterostomies and four lateral intestinal anastomoses, all very successful.

a more perfect mode of fasting in a condition of advanced starvation.

In complete pyloric stenosis, whether of benign or malignant origin, the ligature method is to be severely condemned.* All dogs and cats subjected to a ligature gastro-enterostomy and occlusion or exclusion of the pylorus, died of convulsive autointoxication. Chas. Mayo and Maury report similar experimental findings.

While anastomosis by the ligature method belongs logically to the class of operations in two stages, all of which have for obvious reasons been gradually abandoned, notwithstanding their apparent advantages, sufficient evidence, both experimental and clinical, has been adduced to render unquestionable the superiority of the elastic ligature in various lateral intestinal anastomoses.

On the other hand, the ever-increasing *furor operandi* and particularly the surgeon's surreptitious invasion of the medical man's domain—gastric ptosis and atonic dilatation—call for simple and truly safe surgical measures. The elastic ligature apparently fulfils both of these conditions, but prolonged clinical experience alone can determine its practical value, its indications, its limitations; and, while its simplicity of technique may render it popular with surgeons unduly fearful of peritoneal contamination and unskilled in the use of the needle, experienced men cannot, barring rare circumstances, be expected to give preference to “devices that work while the surgeons are asleep.”

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* In the skillful hands of Ochsner the elastic ligature gave five deaths in a series of 28 patients with malignant obstruction of the pylorus.

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THE REVERSAL OF THE CIRCULATION IN A LIMB.

BY ALEXIS CARREL, M.D., AND C. C. GUTHRIE, M.D.,
OF CHICAGO.

(From the Hull Physiological Laboratory, University of Chicago.)

I. INTRODUCTION.

THE circulation may be said to be reversed in a limb when the red blood flows through the veins in a direction opposite to the venous normal circulation, and the dark blood returns towards the heart through the arteries.

The reversion may be brought about by cutting the main artery and vein of a limb and uniting the central end of the artery to the peripheral end of the vein and the peripheral end of the artery to the central end of the vein. Then from a functional point of view, the vein becomes an artery, and the artery a vein. The capillary circulation is also reversed.

II. OBJECT.

These experiments have been undertaken with the view, both physiological and surgical, of studying the changes of the circulation of the limb after reversal; and of finding a method of preventing gangrene, when the arteries of a limb become unable to carry the red blood to the capillaries.

III. HISTORY.

The reversal of the circulation in the saphenous vein of a dog was attempted by Dr. Berard, associate professor of surgery in the University of Lyons, and Carrel, in 1902, in the laboratory of A. Lumière. The femoral artery and the saphenous vein having been cut in Scarpa's triangle, the central end of the artery was connected by circular suturing¹ to the peripheral end of the vein. After restoration of the circulation, the saphenous vein appeared greatly distended and pulsating,

pulsations being easily perceived even in its course in the leg below the knee. The animal died from infection two days after the operation.

Afterwards, in the laboratory of Professor Soulier, Carrel and Morel succeeded in reversing the circulations in the jugular vein.² The carotid artery, and the external jugular vein, having been cut, the central end of the carotid was united to the peripheral end of the jugular, by circular suturing. The jugular became red, distended, and pulsated like an artery. By auscultation, a strong systolic murmur was heard at the anastomosis. The animal was under observation for several months after the operation, and during this time the vein maintained its arterial functions.³

Prior to this, in the same year, a Spanish surgeon, San Martin y Satrustegui,⁴ attempted to establish a lateral anastomosis between the femoral artery and vein in three goats. Obliteration of the vessels occurred. Afterwards he performed this operation on two patients affected with gangrene of the lower limb. In one case the operation was entirely unsuccessful. In the other, the gangrene stopped, but this was probably due to the fact that the affected portion was amputated at the time the anastomosis was performed.

After these first experiments, a French surgeon, Professor Jaboulay, established a lateral anastomosis of the femoral vein and artery, in a patient suffering from gangrene produced by endarteritis.⁵ The operation was not successful, and an amputation became necessary.

In 1903, Gallois and Pinatelle, assistants of Jaboulay, published the results of this operation, and of the experiments which they had made in order to investigate the possibility of the reversal of the circulation.⁶ Their experiments were performed on a cadaver. A colored fluid was injected under pressure into the main vein of a limb. The fluid returned immediately by all the other veins of the limb. After occlusion of these veins by forceps, it was impossible to cause the fluid to flow through the main vein. They conclude that the cir-

culution of a fluid through the main vein of a limb, in a direction opposite to the normal circulation, cannot be established, owing to the presence of the valves, and that joining the central end of the artery to the peripheral end of the vein is not justifiable.

In this paper the possibility of the reversal of the circulation, and the nature of the operation necessary to bring it about, will be discussed.

IV. POSSIBILITY OF THE REVERSAL OF THE CIRCULATION.

In order to flow through the veins in a direction reverse to the normal, the red blood must overcome the following three physical obstacles

- (a) The valves;
- (b) The numerous anastomosing veins, which decrease the blood pressure by increasing the area of the cross-section of the vessels;
- (c) The resistance of the capillaries.

Logically, owing to these obstacles the reversal seems impossible. Besides, the experiments of Gallois and Pinatelle indicate that the red blood cannot get beyond competent valves. But their experiments were made on a cadaver. Before adopting their conclusions, therefore, it is necessary to consider that the living tissues have a very strong power of adaptation, and to therefore experiment on the living animal. With this view the two following experiments were performed.

EXPERIMENT I.—Interposition of a segment of the femoral vein between the two cut ends of the femoral artery with reversal of the circulation in two collaterals of the vein (7).

May 12, 1905. Medium-sized, strong young bitch.

A. Technique (summary).—Etherized dog. Four centimetres below Poupart's ligament the femoral artery was sectioned. A displaced segment of the femoral vein was interposed between the two ends of the artery, which restored its continuity. This venous segment had two branches, one of which received the dark blood from the adductors, the other from the quadriceps. (Fig. 1, p. 206.)

After restoration of the circulation, Scarpa's triangle was dissected.

The edges of the wound having been joined by means of several forceps, the skin was covered with hot moist compresses. From time to time the wound was reopened, in order to observe the state of the circulation.

B. Results. On release of the clamps on the vessels, the red circulation was immediately established through the venous segment. But the two small collaterals—the vein of the adductors, and the vein of the quadriceps—remained filled with dark blood.

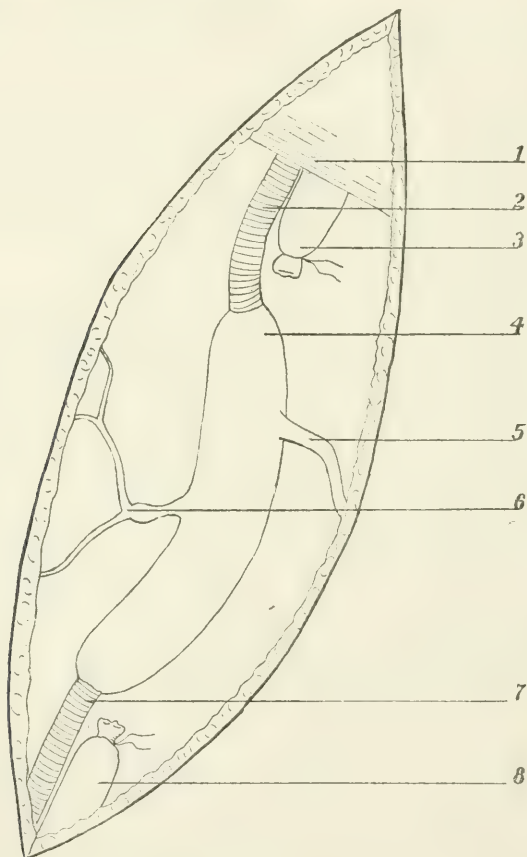


FIG. 1.—Interposition of a segment of the femoral vein, between the cut ends of the femoral artery: 1, Poupart's ligament; 2, femoral artery; 3, femoral vein; 4, a vein from the adductors; 5, a vein from the quadriceps; 6, peripheral end of the femoral artery; 7, peripheral end of the femoral vein.

Fifteen minutes after the operation the red blood had entered the vein of the adductors and pushed the dark blood towards the periphery. A portion of this vein about 3 cm. long and located near the femoral

vein assumed an arterial hue and pulsated strongly. The peripheral ramifications near the muscles were yet filled with dark blood. On making a pressure with the hand upon the adductors, in order to increase the blood pressure in the peripheral ramifications of the vein, the dark blood forced all the red blood out of the collateral vein into the venous segment. On release of the pressure upon the muscles, the dark blood was again displaced by the red blood and filled the vein to its peripheral ramifications, the latter remaining dark. The line separating the red from

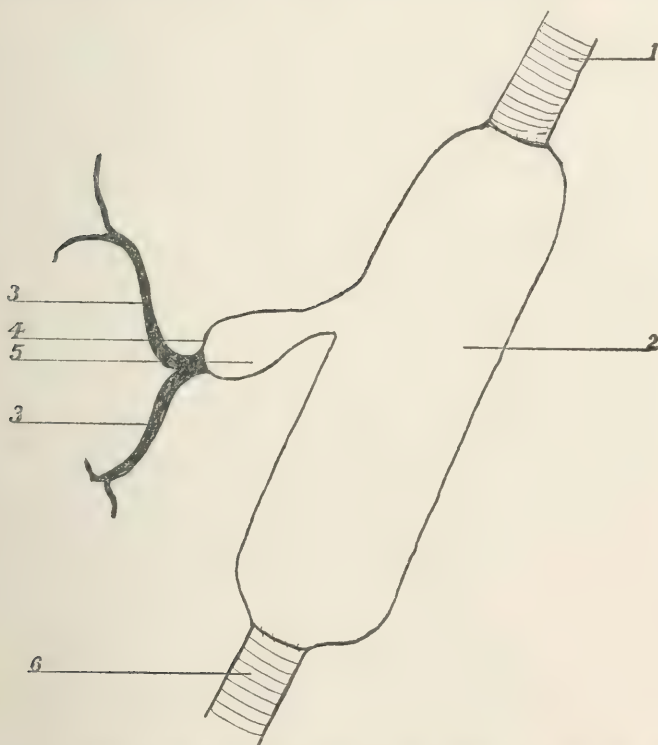


FIG. 2.—Reversal of the circulation through a small valvular vein, one hour after the operation, the valve being not yet forced: 1, central end of the femoral artery; 2, a segment of the femoral vein; 3, small venous branches filled with dark blood; 4, valve; 5, vein filled with red blood; 6, peripheral end of the femoral artery.

the dark blood was stationary. Therefore, no arterial circulation through the vein of the adductors occurred up to this time.

The vein of the quadriceps was filled with dark blood. Near its mouth, a small dilatation was observed, above which the blood was red and below which it was dark. (Fig. II.) This dilatation was pulsating like a small aneurysm. Its lower end marked the location of a valve.

When pressure was made upon the muscle the dark blood, passing through the valve, flowed into the red current of the femoral vein. On release of the pressure the red blood penetrated again the dilatated portion but did not pass beyond the valve.

One hour after the operation the adductor vein and its peripheral ramification had become red. The fine branches appeared like small arteries, after having been dissected out from the muscles as far as pos-

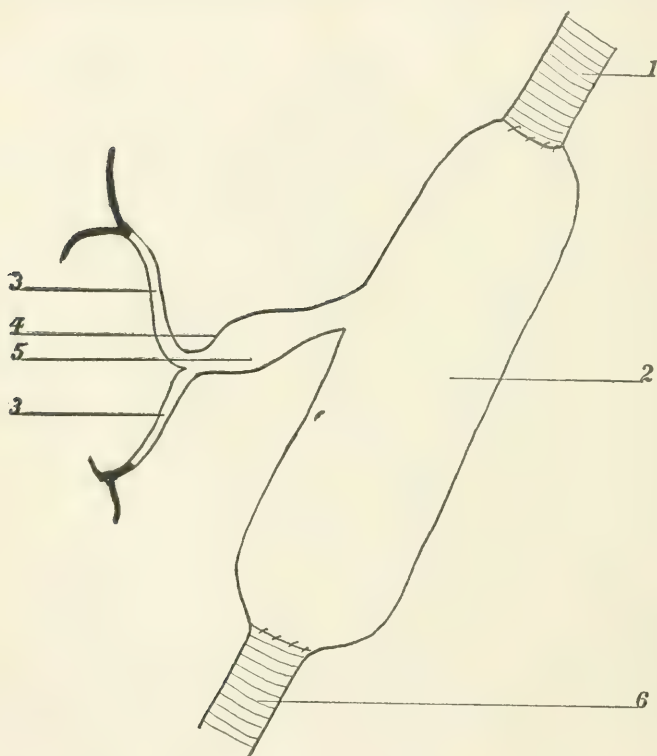


FIG. 3.—Reversal of the circulation through a small valvular vein; two hours after the operation, the valve being forced: 1, central end of the femoral artery; 2, a segment of the femoral vein; 3, small venous branch filled with red blood, the dark blood being compelled to flow towards the periphery; 4, forced valve; 5, vein filled with red blood; 6, peripheral end of the femoral artery.

sible. There was no circulation of red blood through the vein of the quadriceps.

Two hours after the operation the red blood was seen to pass through the valve of the vein to the quadriceps and to push the dark blood outward, (Fig. III.) but it appeared to stop before reaching the peripheral portion

of the vein and the fine intra-muscular branches, which remained filled with dark blood.

Two hours and a half after the operation all the peripheral and intra-muscular ramifications had become red. It was not observed if the small artery of the adductors was filled with dark blood at this time.

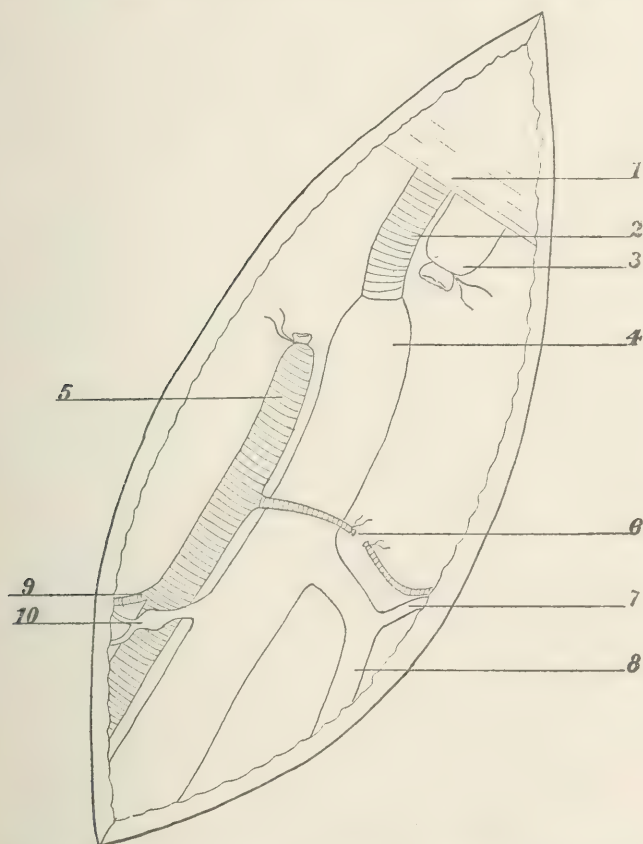


FIG. 4.—End to end anastomosis of the central end of the femoral artery to the peripheral end of the femoral vein: 1, Poupart's ligament; 2, central end of the femoral artery; 3, central end of the femoral vein; 4, peripheral end of the femoral artery; 5, peripheral end of the femoral vein; 6, an artery to the adductors; 7, a vein from the adductors; 8, saphenous vein; 9, an artery to the quadriceps; 10, a vein from the quadriceps.

EXPERIMENT II.—Reversal of the circulation in a limb. June 22, 1905. Medium-sized, very strong young bitch.

A. Technique (summary). Etherized dog. Two centimetres below Poupart's ligament the femoral artery and vein were cut, and the central

end of the artery united to the peripheral end of the vein, by circular suturing. (Fig. IV, p. 209.)

After restoration of the circulation, the saphenous vein and its collaterals, the femoral vein, the deep veins of the leg and their collaterals, the superficial veins of the foot, the femoral artery and the small arteries of the adductors and of the triceps, were dissected out. Afterwards the edges of the incision were joined by means of forceps, and hot moist sponges were placed over the part. From time to time the wound was reopened, and the condition of the circulation observed.

B. Results. Immediately after the operation, the arterial blood, passing through the anastomosis, flowed into the femoral vein, which assumed an arterial hue and became very distended. To the touch, strong pulsations were manifest.

The arterial blood did not enter the mouth of the saphenous vein, which was situated in Scarpa's triangle near the apex. The blood in the saphenous vein remained dark. Its walls were distended, owing to stasis of the venous circulation and to the increase of pressure in the femoral vein. No pulsations were perceptible to the touch. Three centimetres below its mouth, a branch was given off to the adductor muscles. This collateral was dark and did not pulsate.

Fifteen minutes after the operation the walls of the femoral vein were less distended. In the popliteal region the vein divided into two branches, one of which was red, the other dark. The saphenous and the superficial veins of the thigh, of the leg, and of the foot were distended with dark blood and did not pulsate.

While inspecting the circulation in the veins, the first valve of the saphenous vein was seen to give way. The red blood slowly entered the mouth of the saphenous vein, pushed the dark blood toward the periphery as far as the mouth of the adductor vein, and then stopped. Immediately below this point a little dilatation filled with red blood was observed. The lower end of this dilatation marked the location of a valve—the second valve of the saphenous vein—below which the vessel was filled with dark blood. Almost immediately the arterial circulation was established through the adductor vein, which became red and began to pulsate.

About thirty minutes after the operation the lower portion of the saphenous vein suddenly became filled with red blood, which flowed towards the upper portion of the vessel; *i.e.*, centrally. Thus, the whole vein became filled with red blood, but the direction of the current was not the same in the superior and the inferior portions of the vessel. By pressing the blood from the superior segment of the vein, and then removing the pressure in order to allow the circulation to become re-established, it was seen that the red blood was flowing from the femoral vein to the vein of the adductors, but that it was unable to get beyond the second valve of the saphenous.

The same experiment showed that, in the portion of the vessel located below the second valve, the blood flowed from the periphery to the

centre, *i.e.*, in the direction of the normal venous current. The red blood entered the lower part of the vein through the anastomoses between the deep veins of the leg, but all the valves of the saphenous vein were not yet forced. All the superficial veins were yet dark. On each of them and very close to the saphenous, a small dilatation filled with red blood was observed.

An hour after the operation a small branch from the femoral artery accompanying the vein to the adductor muscles was doubly ligated near its origin and cut between the ligatures. A small opening was then made through the wall, just peripheral to the distal ligature. At first no blood escaped, but about fifteen minutes later, dark blood began to escape, and the rate of flow gradually increased.

The peripheral end of the femoral artery immediately below the ligature was then hemisected. A large hemorrhage of red blood occurred, in which it was possible to see several lines of dark blood, the whole being comparable to the mingling of the water of a small, muddy stream with the clean water of a large one.

Two hours after the operation, dark blood flowed from the branch of the femoral artery to the adductors, on opening the wound in its wall. A transverse section of the peripheral end of the femoral artery gave rise to a large hemorrhage, consisting of red and dark blood in about equal proportions.

Three hours after the operation the saphenous and femoral veins and most of their branches were filled with red blood and pulsated like arteries. Almost all the valves of the saphenous were forced, but when it was emptied by pressure it was observed that the red blood flowed more easily upward than downward, and that the second valve had not been forced.

The artery of the adductors was dark, and had the appearance of a vein. An incision of its wall gave an abundant hemorrhage of dark blood only.

The femoral artery was distended, without pulsations, and of a venous hue. Hemorrhage produced by a lateral wound consisted mainly of dark blood, but in it could be seen a few lines of red blood. All its collaterals were filled with dark blood excepting a deep one coming from the posterior part of the thigh, which remained filled with red blood.

Four hours after the operation, the femoral vein and its collaterals, the saphenous vein, and the veins of the leg and foot, were filled with red blood, but a large collateral in the popliteal region and a few small collaterals along the course of the saphenous vein remained filled with dark blood. If pressure was made on the muscles, the dark blood in the collaterals of the saphenous vein entered the main trunk, where it could be seen through the vessel-wall as a black line in the red blood. This shows that the blood-current through the lower part of the saphenous was directed upward (central), as far as the mouth of the adductor vein, and that, from this point to the femoral vein, the current was downward (peripheral). The second valve of the saphenous had not yet been forced.

Abundant hemorrhage of dark blood from the artery of the adductors was observed on opening the vessel-wall. The femoral artery was distended by dark blood, which was mingled with a very small quantity of red blood which came from an anastomosis with the arteries of the posterior region of the thigh.

The dog was killed five hours after the operation.

These two experiments demonstrate that :

(a) The valves prevent, at first, the reversion of the circulation in the veins.

(b) After a short time, the valves gradually give way and the red blood flows through the veins as far as the capillaries.

(c) Finally it passes through the capillaries, and the arteries are filled with dark blood. Probably dark blood also returns from the capillaries towards the heart through some veins.

(d) Practically complete reversal of the circulation is established about three hours after the operation.

V. THE OPERATION PROPER TO ESTABLISH THE REVERSAL.

The above experiments show that the main artery and vein of a limb having been cut, the anastomosis of the central end of the artery to the peripheral end of the vein produces the reversal of the circulation. The operation is completed by uniting the central end of the vein to the peripheral end of the artery, in order to permit the dark blood, which fills the artery when the circulation is reversed, to reach the heart. Perhaps it is not absolutely necessary to perform this second anastomosis, for the dark blood may come back from the capillaries to the heart through other veins. Further observations on this point will be made.

Another operation, consisting of a lateral anastomosis between an artery and vein, without occlusion of the trunk of either vessel, will be discussed, for the reason that it has been used,—unsuccessfully, however,—with a view almost similar to ours.

In order to determine the result of this operation, the following experiment was performed:

Lateral anastomosis of the femoral artery and vein. July 7, 1905. Small-sized, strong young dog.

A. Technique (summary). Etherized dog. A lateral anastomosis was established between the femoral vein and artery in Scarpa's triangle on the right side. Temporary hæmostasis being accomplished by means of suitable artery forceps, a longitudinal incision about 12 mm. long was made through the wall of the artery and vein. The posterior edges and afterwards the anterior edges of the wound, were approximated by a continuous suture. The opening between the artery and the vein was about 1 cm. long.

A short time after the operation the arteries and the veins of the limb were carefully dissected and observed.

B. Results. After removing the clamps on the vessels, the red blood flowed through the anastomosis from the artery to the vein, and the latter became distended. This anastomosis did not produce stenosis of the arterial channel, the circulation through the artery below the anastomosis apparently being normal.

Ten minutes after the operation, above the anastomosis, the vein was red and to the touch, systolic pulsations were manifest. Almost immediately below the anastomosis, the vein became darker, and one and one-half cm. lower it presented the normal hue of a vein. It was markedly distended, but no pulsations were observed. The saphenous vein, in its inferior portion, was distended, but without pulsations.

Sixty minutes after the operation there was a normal red circulation through the artery. An active red circulation through the central end of the vein was observed. No circulation through the peripheral end of the vein could be seen. Below the anastomosis, the first three centimetres of the vein had become red. The walls were distended and pulsating as far as the inferior part of the thigh, but obviously there was no circulation, for the hue remained venous.

The adductor vein, the mouth of which was about two centimetres below the anastomosis, was dark and distended.

No red circulation through the superficial veins of the foot, or through the saphenous vein. Phonendoscopic auscultation showed:

(a) On the central end of the artery, a strong continuous murmur, with rude systolic increase;

(b) On the central end of the vein, a very strong systolic murmur;

(c) On the peripheral end of the artery and of the vein, a continuous murmur.

On clamping the peripheral end of the vein, no modification of the continuous murmur by auscultation on the anastomosis could be detected. When the clamp was placed on the central end, the continuous murmur ceased immediately, and was succeeded by a systolic murmur.

Two hours and forty minutes after the operation, above the anastomosis, and also, as far as 4 cm. below the anastomosis, the vein was red and pulsated strongly, but in the inferior part of the thigh it was dark. The adductor vein was dark, distended and pulsating. Near the mouth a small red column, about 1 cm. long, was observed. The saphenous vein was dark and congested. No red circulation could be detected through the vein of the foot.

A lateral opening made through the wall of the inferior portion of the femoral vein produced a large hemorrhage of dark blood. A complete section of a vein of the foot produced a large hemorrhage entirely of dark blood.

Three hours after the operation no evidence of a reversal of the circulation could be detected. At this point the experiment was discontinued, and the animal killed. The post-mortem examination showed a large communication, about 1 cm. long, between the artery and the vein.

This experiment demonstrates that:

(a) After lateral arterio-venous anastomosis a very large portion of the red blood returns immediately toward the heart through the central end of the vein.

(b) The peripheral portion of the vein and its collaterals are distended and pulsate, but the valves are not forced and the red blood does not circulate through them.

(c) Three hours after the operation, all the valves are yet competent, and no beginning of the reversal of the circulation can be detected.

VI. CONCLUSIONS.

1. The reversal of the circulation in a limb of a dog is possible.

2. It can be established by an end to end arterio-venous anastomosis.

3. Under the same conditions, the lateral anastomosis does not establish the reversal of the circulation.

The permanent results of these operations, a series of which are being performed under aseptic technique in this laboratory, will be published later. If normal nutrition of the limb were possible, and the results of the end to end anastomosis permanent, the operation would perhaps be proposed

for the preventive treatment of gangrene following obliteration of the arteries.

We wish to thank Dr. Stewart for granting us the privileges of this laboratory.

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CARCINOMATOUS METASTASES DEVELOPING OVER THREE YEARS AFTER REMOVAL OF THE BREAST WITHOUT LOCAL RECURRENCE.¹

BY B. FARQUHAR CURTIS, M.D.,

OF NEW YORK,

Professor of the Principles of Surgery in the University and Bellevue Hospital Medical College; Surgeon to St. Luke's and Bellevue Hospitals.

OF fundamental importance in the decision of the question of the curability of cancer by operation is the localized character of the growth. When metastasis has occurred, no matter how thorough the removal of the primary tumor, the continued growth of the secondary deposits will nullify our efforts to obtain a cure. The modern methods enable us to cope with extensive local disease, and to follow it to the nearest lymph nodes with a reasonable hope of thorough eradication, and of freedom from recurrence. But a single distant metastatic deposit renders us practically helpless.

If the presence of a secondary deposit in a situation whence it can be removed by excision of the tumor, or ablation of the affected part or organ, is recognized at the time of proposed removal of the primary tumor, three questions arise: 1st, Shall we remove the primary tumor alone? 2d, Shall we remove both primary and secondary tumors? 3d, Shall we decline any operation?

(1.) In certain cases the primary tumor causes symptoms which seriously inconvenience the patient or threaten life, and then the tumor should be removed if the operation is not too severe, even when the secondary tumor cannot be removed. As there is no hope of a radical cure, extensive operations are not advisable, and, fortunately, comparatively slight operations afford the desired relief in such cases.

(2.) Under certain circumstances, as when the patient is in vigorous condition, when both primary and secondary tumors are easily removable, and when there is absolutely no

¹ Read before the New York Surgical Society, October, 1905.

sign of other deposits of the disease, we might venture on the thorough removal of both tumors. The justification for this course lies in the abundant evidence in careful postmortem examinations that a single secondary tumor may reach a very full development, even sufficient to cause death, without any other metastatic deposits, and that this may occur even while the primary focus is still limited in extent and easy to remove. Such single secondary deposits may develop in the kidney, the other breast, or in a distant bone of the extremities, from a primary carcinoma of the breast, and all of these lesions might offer an opportunity for successful surgical treatment.

(3) But in my personal experience I cannot recall a case in which the conditions were such as to justify removal of a distant secondary tumor at the time of operation on the primary tumor. Even when the secondary tumor appeared or was discovered after successful removal of the primary focus without local recurrence the conditions have never warranted operation. In every case the patients' general condition has been poor or it seemed probable that other secondary deposits existed although they were not evident. We must conclude, then, that in practice one will rarely meet with a case of malignant disease in which it will be good surgery to remove both the primary lesion and a distant metastasis.

The occurrence of secondary deposits which gave no symptoms and could not be recognized at the time of operation for the original disease, but soon became evident afterwards is unfortunately very common. We need only emphasize the necessity for a careful examination of the entire body before undertaking the removal of a malignant growth, in order to discover, if possible, any such secondary tumors.

Our results in the removal of malignant growths have so greatly improved that we feel fairly confident of freedom from local recurrence if the operation can be performed before the disease has spread too far. This freedom from local recurrence is often spoken of as a cure of the disease and in fact a permanent cure is often effected. But in the individual case we are still uncertain as to the length of time which should elapse without local recurrence before the patient can be considered free from danger of any return. When operations

were less complete and thorough than they now are, the number of patients who remained well for three years or more was not very great. It is not surprising, then, that late recurrences locally, or late appearance of secondary tumors, were rarely observed. Now, however, a very large number of persons have survived for long periods after the removal of the primary tumor, and there must be an increasing number of cases with late recurrence. This is indicated by the fact that there is a constant demand for a lengthening of the period which must elapse before a cure can be claimed, even limiting the question to the local or regional recurrences. The old period of three years of freedom from recurrence has been generally discarded and we hear demands for five years, ten years, or even longer periods. If we take into consideration not merely the local recurrences, but include the late-appearing metastases, ten years is not too long, as shown by the following cases operated upon by me. I have reported only those cases in which the secondary deposits were observed three years or more after the removal of the primary tumor, without local recurrence.

CASE I.—Annie C., thirty-seven years of age, married, born in Ireland. Carcinoma of left breast, with slight axillary involvement; removed October 11, 1889, at St. Luke's Hospital. A recurrent nodule formed in the scar and the latter with the entire pectoralis major muscle was removed January 13, 1890. The other breast became carcinomatous and was removed with the pectoralis major December 16, 1892. Dr. H. H. Robinson, of Goshen, examined her and kindly reported November 18, 1895, that there was no sign of recurrence. Soon after vague symptoms of intrathoracic complications arose and she died August 25, 1896, of a secondary tumor in the mediastinum, pushing forward and involving the ribs and sternum on the left side, nearly four years after the last operation. (Letter from Dr. T. D. Mills, of Middletown.)

CASE II.—Florence A. C., thirty-eight years of age, widow, born in United States. Carcinoma of right breast, numerous small glands in axilla. Removed breast and axillary contents March 22, 1894, at the General Memorial Hospital. The wound became slightly infected but healed in about four weeks. She

remained well until February, 1904, ten years after the operation, when examination showed some swelling of the sternum and the supraclavicular glands of the opposite (left) side became enlarged. There was no local recurrence. There was dulness on percussion over the sternum and to the left of it, with diminished breathing over most of the left lung. She had a dry cough, resembling the reflex cough of thoracic aneurism. Three weeks later, in a violent fit of coughing she suddenly lost part of the field of vision in the right eye and Dr. E. J. O'Shaughnessy, of New Canaan, wrote that an examination of the eyes revealed a tumor in the fundus. She died in April or May, 1904.

CASE III.—Minerva K., forty-three years of age, married, born in New York. Carcinoma of the left breast; removal with the axillary contents at the General Memorial Hospital, April 11, 1895. She remained well until March 14, 1901, when she complained of dyspnoea and cough and pain in the scar, which remained healthy. Nothing could be found of an abnormal character in the examination of the chest. The symptoms gradually grew worse, and when examined November 30, 1903, marked physical signs of internal thoracic deposit were discovered. There was also great enlargement of the sternum. There was no local recurrence. She has not been seen since, and has probably died.

CASE IV.—Mary A. B., sixty-five years of age, married, born in New York. Carcinoma of the left breast, several nodules following a chronic mastitis. Breast and axillary contents removed at the General Memorial Hospital March 21, 1896. I saw her October 18, 1899. She had hematuria and the left kidney was enlarged. The scar was healthy. March 8, 1901, Dr. G. A. Crump wrote that she still had hematuria, and that there was a growth in the vagina which felt like colloid material and bled readily. The breast scar remained free from recurrence. She died soon afterwards.

CASE V.—Harriet E. K., forty-nine years of age, married born in New Jersey. Carcinoma of the right breast, glands small but extensively involved. Breast and axillary contents removed at the General Memorial Hospital, April 27, 1896. In August, 1899, I examined her and found no local recurrence. She had some vague nerve symptoms which I ascribed to hysteria and morphine addiction, as both conditions were present. Soon

after, paralysis slowly developed, with curvature of the spine and severe neuralgic pains. She died in March, 1901, and Dr. J. Arthur Booth, who had charge of her towards the end and made the autopsy, kindly informed me that he found carcinoma of the vertebræ and some nodules also in the spleen.

I could add to these some cases of tumors in other situations, such as a pylorectomy for carcinoma remaining well until a tumor of the iliac bone developed five years later; and a sarcoma of the foot treated by local excision, without local return, but the patient died of pulmonary sarcoma in three years. But in order to make the material homogeneous I have limited the cases to those associated with tumor of the breast.

I have made no search in the literature for similar cases, as I believe that the cases there are as yet too isolated to be of much value, but the following were at hand and may be mentioned:

Poulsen (*Arch. f. kl. Chir.* xlii. S. 616,) reported three cases of amputation of the breast with late metastases, the patients dying from five to eight years after the operation. Schmidt (*Deuts. Zeitschr. f. Chir.* xxvi. S. 139), recorded a case of death from metastasis in lungs and liver seven years after removal of the breast. Clairmont (*Arch. f. kl. Chir.* 1904, lxxiii. S. 620) reported a case of late metastasis in the bronchial glands ten years after a nephrectomy for adrenal tumor. König (*Verh. Deutsche chirurg. Congress.* 1903, S. 72) mentioned two cases of late secondary in the neck, ten and thirteen years after removal of the breast. Lomer (*Zeitschr. f. Geb. & Gyn.* Bd. 50, S. 358) quoted from Lubarsch (personal communication) an autopsy on a woman who died of pneumonia, whose left breast had been amputated five years before, microscopic examination of the axillary glands on the left side showing carcinomatous nodules present in them, but the cells showed no mitoses. Petersen (*Beitr. z. kl. Chir.* 1904, xliii. S. 171) quoted a case of von Beck in which a patient died of intestinal obstruction three years after a pylorectomy, and a small carcinoma was found in the sigmoid flexure and also a nodule of carcinoma in the center of a small uterine fibroid.

There had been no recurrence in the stomach. Labhardt (*Beitr. z. kl. Chir.*, xxxiii. S. 571) collected several cases, of which two can be added to our list, death from metastasis in the liver five years after removal of breast (von Meyer); and in the lung ten years after a similar operation (Jones and Platt).*

Two hypotheses suggest themselves by which to explain these peculiar cases. We may suppose that these late-developing tumors are independent growths, an hypothesis which will account for some cases very readily, especially when the secondary tumor lies in an organ commonly attacked by primary carcinoma, such cases as involvement of the other breast after one has been removed, or of cancer of the stomach or uterus following cancer of the breast. But the numerous cases with involvement of lungs and liver, organs in which primary carcinoma is rare, do not admit of this explanation. Secondly, we may suppose that the cells from which the secondary tumors spring may have been deposited before the removal of the primary tumor, but have lain latent or developed so slowly that they do not become clinically evident for many years. Opposed as this theory is to our preconceived ideas of the growth of carcinoma, and especially of the tumors secondary to carcinoma of the breast, there is considerable pathological evidence of its probability. When a late local recurrence also takes place we have clear proof that some cells left by the operation have lain latent, and these are not so uncommon, but in our cases there was no local return.

Such authorities as W. Petersen (*loc. cit.*), Lubarsch (*Zur Lehre v. d. Geschwülsten u. Infektionskrankheiten*), M. B. Schmidt (*Die Verbreitungswege der Karzinome u. s. w.*, Fischer, Jena, 1903), Lomer (*loc. cit.*), Fraenkel (*Wien. kl. Wch.* 1898, S. 465) and Schuchardt (*Centr. f. Gynec.* 1901, S. 664) argue that in most cases of carcinoma the actual metastases are much more frequent than supposed, and that probably few primary operations really eradicate all the disease, yet an apparent cure may be obtained lasting for many years. The carcinomatous deposits left behind remain latent

*See also Schroeder, *Beitr. z. kl. Chir.* xlv. S. 685-6, Fälle 6, 7, 9, 10, 12, 13.

and may even undergo retrogressive changes as in Schuchardt's case, in which peritoneal nodules with ascites were found when a carcinoma of the pylorus was removed, yet on autopsy after death from pleurisy over two years later, not only was there no recurrence in the stomach, but the peritoneal nodules had entirely disappeared. We know well how the tissues and cells resist various bacterial infections by phagocytosis, by encapsulation with fibrous tissue, or by direct action of antitoxines upon the bacteria. It is not impossible to imagine that the carcinoma cells could be attacked by the same means, and we can even form the hypothesis that a thorough removal of the primary tumor may not only get rid of the local disease, but may have a beneficial effect upon the resistance of the tissues to the secondary deposits. So much is now appearing with regard to cytolytic ferments and their actions that it seems quite within the bounds of probability to suppose that the large mass of cells in the primary tumor may keep in circulation some chemical bodies which unfavorably affect the resistance of the tissues, and that the removal of this factory of toxic substances might restore the normal resisting power, and enable the tissues to destroy or encapsulate small deposits of cancer cells.

It might be well to note the bearing of these facts and theories upon the usefulness of the operative treatment of cancer. While the cases related detract somewhat from the brightness of the prospects for a radical cure by operation, the number of persons who suffer from these late appearing metastases is not large in comparison with the number of persons who remain free from local recurrences after successful removal of tumors. Even in these cases the interval of freedom is in itself enough to prove the practical usefulness of the primary operation, especially if it approximate ten years. A free interval of ten years at the time of life when the majority of the operations for cancer are performed affords a practical cure, for many of the patients will die of other causes before the disease returns or develops. It cannot be argued that if we cannot remove the disease entirely there is no use in the operation, neither can it be said that operations should be less extensive, leaving the

remainder to be dealt with by the resistance of the tissues. Practical experience is against both of these assertions, for the results have improved with the enlargement of the scope of operation. We may even claim that the facts are encouraging, because formerly we had supposed that immediate and prompt recurrence was to be expected when we left behind even the smallest portions of disease, whereas in the light of this evidence we can hope that minute cancerous deposits can be checked in growth or annihilated. Further, if our theory is correct, the removal of the primary tumor assists in this result. Similar effects are seen in the operations for removal of foci of tuberculous disease, for here, too, the results improve with the extension of the operations, and it is well known that the individual is assisted in his combat against a more or less general infection by being relieved of the principal mass of infected tissues.

CARDIO-SPASM.¹

WITH REPORT OF AN OPERATIVE CASE.

BY JOHN F. ERDMANN, M.D.,

OF NEW YORK CITY,

Clinical Professor of Surgery in the University and Bellevue Hospital Medical College.

TWENTY months have elapsed since the operation in this case, having felt that a sufficient amount of time should be given to demonstrate a cure before reporting it in detail as a cure.

The patient, a female, thirty-three years of age, called upon me on the 7th day of September, 1903, and gave the following history: There was no family history of any note whatever that might in the least have any bearing upon her condition. She has been married four years, never had any children, and has had no occasion to be of a nervous temperament, although she had taught school for a number of years previous to her marriage.

Three years ago, had noticed a peculiar swallowing rattle, as she expressed it, in the throat, which in four or six weeks was followed by difficulty in swallowing foods and cold drinks, giving her an impression of pressure back of the lower portion of her sternum. All things seemed to go down the wrong way. At times she could apparently swallow substances to amount to a small slice of bread. There was invariably, after a short period, vomiting of the material swallowed, varying in extent from the entire quantity to about two-thirds of that swallowed.

From September to Christmas of 1902, she gradually lost weight, weighing during the holidays one hundred and twenty-five pounds, as compared to one hundred and eighty pounds in September—a loss of fifty-five pounds in three months. She now, September 1903, weighs one hundred and forty-four pounds.

She further states that she is positive from her sensations that the materials swallowed all collect or lodge above her stomach, and in the region of her pain, and that her pain is of a boring

¹ Read before the New York Surgical Society, November 22, 1905.

character, travels up to her throat, and is somewhat increased during her menstrual periods. That lying down does not cause the ingested stuffs to flow out, but that she is more prone to backache when occupying this position. A small amount of mucus also is vomited each time. That she has gained the nineteen pounds in weight,—the difference between the Christmas weight of one hundred and twenty-five pounds and that of to-day, September seventh,—by the use of the stomach tube which some one of her physicians had recommended. She states that during the entire winter of 1902, large sized dilators and a stomach tube had been employed. Early in the history of her trouble hot drinks would relieve her pain, but at the present time are entirely inefficacious.

Examination.—The patient is a female of large build, and rather poorly nourished, although she says her general health is good. Her skin and muscles are flabby. Abdominal palpation reveals no visceral enlargement. Lungs and heart negative.

Upon examining the œsophagus, No. 40F. enters readily until within the vicinity of the cardia, No. 26F. and No. 20F. also are checked at the same distance, while No. 16F. passed, but was gripped slightly. Successive sizes were then passed up to No. 26F.; a rest for twenty-four hours was advised, and bland, semi-solid food ordered. She returned on the following day, September 8, and owing to some soreness, No. 28F. only was passed. On September 9, she reports having swallowed some bread and a bit of beefsteak, without the use of the stomach tube. Bougies up to No. 36F. readily passed.

September 11 reports that she has been taking solids, but that she has a distinct sense of fullness at the usual site, before a satisfying quantity of food has been taken. To-day for the first time, complains of a lump or ball gripping her in the throat, pointing at this time to the larynx; No. 36F. passed. Patient wished to return to her home, so I instructed her to pass a large bougie herself, and No. 40F. was supplied her.

She did not report in person again until January 5, 1904, although by letter she stated that she was able to swallow fairly well, but still had her daily pressure and "fullness" sensations, and that she still vomits.

At this time, January 5, 1904, she is somewhat heavier than

in September, 1903, and says that she has been taking bread and finely chewed meats, but still has her sternum pressure. No. 40F. bougie does not pass; No. 36F. passed with slight difficulty.

During the period dating from September 9, 1903, to January 5, 1904, I was inclined to feel that a fair element of hysteria had more or less to do with the spasmodic condition, and had her placed upon bromides and valerianates, basing my reasons for such medication upon her statements of increase in trouble at the time of her menstrual periods, and also upon the ball and gripping (globus hystericus) sensation in her laryngeal region.

She (January 5, 1904) now comes to me telling me that the diagnosis of œsophageal diverticulum has again been made, and desires me to again make a careful examination. I was satisfied that her lesion was at the cardia, because no deflection or check occurred to the bougie in any portion of the upper four-fifths of the œsophagus. For further satisfaction to the patient, and to eliminate any stomach lesion that might, by reflex, influence the cardia, I recommended her to Dr. George Roe Lockwood, who advised her to remain under his observation for a few days.

She returned home, and on January 11, was admitted in the Private Hospital Association under Dr. Lockwood's care.

10 A.M.—Tube passed and fed; unable to hold half-pint.

1 P.M.—About fourteen ounces of fluid taken without the tube.

5 P.M.—Dr. Lockwood passed the tube, and withdrew one pint of sour smelling liquid.

From this date on, until January 27 with few exceptions, the patient was fed by the tube, and occasionally by the rectum. A bougie was passed of largest size almost daily, and the stomach tube passed and allowed to remain for a period of thirty minutes. During this period there would be frequent expulsions or siphonages of various types of colored fluids, and of pap to fluid consistency, varying in quantity from a few ounces to several pints. Passing the bougie was easily accomplished one day, and the next an absolute obstruction would be met with, while the stomach tube rarely encountered any obstruction.

January 27th the patient weighs one hundred and thirty pounds, being a loss of fourteen pounds in a month.

Dr. Lockwood was satisfied that all mechanical and medicinal



FIG. 1.—Cardio-spasm.



FIG. 2.—Cardio-spasm.

means had been given a fair trial, and suggested the Mikulicz operation, and to this I more than agreed.

The patient gladly grasped at some means of cure, and accepted the treatment, requesting the privilege of a visit to her home before submitting.

She returned, and came under my care in the same institution on March 6, 1904; was given calomel, and several hours later, the stomach was washed out with two pints of salt solution. The latter was repeated at noon of the day of the operation.

Operation, March 7, 1904.—Median epigastric incision about five inches long. Stomach easily exposed, was found lying in an absolutely transverse position, and contracted so that it was less in diameter than the large intestine. An incision was made in the long axis of the stomach, sufficient to admit the hand, in this instance about four inches long. (See Fig. 1.)

The cardia readily located, but impossible to introduce a finger. Dr. Lockwood, at my suggestion, passed an œsophageal bougie, and while holding my finger in the neighborhood of the cardia, I could feel, through the stomach's lesser curvature, the bougie passing down toward the right, then sweep over to the left, describing a distinct sickle curve; then the point entered the cardia, and passed into the stomach. The bougie was then gradually withdrawn, and followed by my index finger. After this it was an easy matter to introduce the second finger, and proceed with the dilatation (Fig. 1). The impression gained by visual observation of the stomach, and palpation of the walls of the œsophagus, is schematically represented by Fig. 2.

After the second finger, a third was introduced, stretching the non-resisting cardia fully four to six c.m. as suggested by Mikulicz. While the two fingers were in the œsophagus, up to the metacarpo-phalangeal junction, I struck by the absence of contact with the walls. Separating the fingers as widely as possible, I was just able to come in contact with the lateral surfaces. After completely outlining the walls by palpation, the impression of size and shape were given as shown in the illustration.

The pouch was located chiefly to the right of the spinal column, the vertebræ being readily outlined through the posterior wall. The opening in the stomach was closed by three rows of

sutures, the first and second being continuous chain stitch, and the third (Lembert).

Nothing of any note occurred after the operation, except bloody vomiting for twenty-four hours, and that on the ninth post-operative day a small sinus developed in the wound, which closed in three or four days. On the afternoon of the 8th of March a small quantity of water was allowed by mouth; nourishment entirely by rectum. Liquid nourishment was given by the mouth in small quantities on the third day; a raw egg on the fifth day; and on the seventh post-operative day she was given soft-boiled egg and bread, baked potato and gravy at different times.

From this time on nourishment of the more solid variety was given, and rectal alimentation was discontinued on the ninth day. The patient was discharged on the twenty-first day.

Numbers of grateful letters have been received from the patient, all containing the satisfactory news of increase in weight, and that no more of the former symptoms exist whatever.

At the close of the first year, she wrote that a gain of 35 pounds had been noted in her weight. About two months ago, she called upon Dr. Lockwood and myself, and stated that she was still a cured case, and had added a few more pounds to her weight of April second.

Mikulicz, in the "Deutsche Medicinische Wochenschrift," of January and February, 1904, has contributed quite an extensive article titled, "Zur Pathologie und Therapie der Cardio Spasmus," and reports four cases, two over one and a half years, and two about nine months post-operative duration, in which he calls attention to the differential diagnosis of these cases from carcinoma, diverticulum and stenosis, and dismisses the questions by citing but two of the symptoms and signs of this disease, both of which were well marked in this case. First the pear, or flask-shaped dilatation, invading the lower one third to two-thirds, which may be of such dimensions as to contain from a few ounces to two pints and over, and that owing to the spasm at the cardia the neck of the flask or small end of the pear-shaped dilatation is always upward (see illustration). The contents of this dilatation can be siphoned off, irrespective of those of the stomach, etc.

Second, the dysphagia of cardial type, well expressed in the history of my case, and attributable to the retained contents producing an erosion, or œsophagitis accompanied with erosions.

Under the question of ætiology, numbers of causes are given in his article, among them being. (I), primary cardio spasm (Mikulicz and Meltzer); (II), primary atony of the musculature of the œsophagus (Rosenstein); (III), synchronous paralysis of the circular œsophageal fibres; with spasm of the cardia due to a vagus involvement (Kraus); (IV), congenital, (Fleiner); (V), primary œsophagitis, (Martin).

The operation performed by me in this case was after the method of Mikulicz, as briefly but very indefinitely described in the above journal.

Treatment in these cases at this date resolves itself more into a mechanical than an operative treatment, with the latter as a final resort when instrumentation fails.

Mikulicz' idea in manual divulsion of the cardia was to produce a similar effect to that found in stretching any sphincter to a point productive of paralysis. Whether he felt that by producing such paralysis and allowing of constant emptying, the muscle would return I do not know, but personally I feel that this effect should and could be obtained by this means.

That this paralysing effect is possible with properly constructed instruments, must be admitted, and recently H. Straus reports in the "*Kleinsche Woch.*" No. 49, 1904, one case of a male 30 years of age, with a history of ten years' duration, cured or markedly improved by the use of a stomach tube, to the distal end (above the eye) of which an inflatable rubber bag is attached, in such manner as to appear that the tube had passed through the bag's or balloon's centre. To the side of the stomach tube, a very small-calibred rubber tube is attached, that connects with the inflatable bag. This tube terminates proximally in a mouth piece through which air is blown. A safeguard in the shape of a mercurial pressure, regulating apparatus is used.

This instrument is introduced so that the bag when in the stomach is in a deflated condition, then air is blown in until the mercurial gauge showed pressure equal to complete

inflation. Air is then let out so as to partially deflate the bag, and then the tube withdrawn sufficiently to engage the distended bag in the cardia, and eventually pull it through. Numerous sittings are given.

Dr. Lockwood has devised an ingenious instrument, on the Kohlman urethral dilator pattern, but has discarded it owing to its proving unsatisfactory. The same in a certain sense must be admitted of all instruments devised for this purpose, for the following reasons: Danger of rupture of the tissues by an instrument that cannot give the accurate impression of resistance that is given to the finger; inability to properly perceive the proper location by these devices, and thereby needlessly cause unnecessary discomfort; that in the rubber-bag variety, if the cardia is rather resisting, the air being driven downward, one of two things will occur: either the bag will rupture into the stomach, a matter of no consequence, or by forcible pulling, the air bag will flatten out and may produce serious visceral lacerations.

In conclusion I would suggest the following:

The use of some apparatus allied to Kraus', but with little force used in its extraction. Should several sittings not be followed by evidence of improvement and cure, that the operation of gastrostomy, with manual dilatation, as detailed above, should be done.

THE TREATMENT OF DIFFUSE SEPTIC PERITONITIS.¹

BY ROBERT G. LE CONTE, M.D.,

OF PHILADELPHIA.

WHILE in Chicago a month ago I was astonished to hear Murphy say that in his last 29 cases of diffuse peritonitis he had had but one death; and the purpose of my remarks this evening is to recount his technique in these cases and bring the subject before you for discussion. The majority of us, I think, have been in the habit of douching the peritoneum with large quantities of sterile salt solution, with or without partial evisceration, where the infection was diffuse. This has been our practice at the Pennsylvania Hospital, and our mortality is probably between 70 and 80 per cent., for we receive many cases in the last stages of septic peritonitis, where operation is undertaken as the only chance in an otherwise hopeless condition. If more than 20 or 30 per cent. of such cases recovered, we fancied our technique was rather superior.

While the procedures of Murphy do not present anything particularly new, he has assembled in his technique all of the good things to do and has eliminated the unnecessary or harmful ones. His principles, from a theoretical standpoint, will appeal to everyone, and in practice the theory is sustained by the excellent results obtained. The essentials of his technique may perhaps best be stated under six headings:

1. The rapid elimination of the cause of the peritonitis, whether it be a perforation of the bowel, a gangrenous appendix, a ruptured pus tube, etc. This must be done with the least possible handling of the peritoneal contents.
2. Drainage by tube of the lowest portion of the pelvis through a suprapubic opening, and free drainage through the operative incision.

¹ Read before the Philadelphia Academy of Surgery, November 6, 1905.

3. The elimination of all time-consuming procedures at the time of operation.
4. The semi-sitting position of the patient after operation, the so-called Fowler posture.
5. The absorption of large quantities of water through the rectum, which reverses the current in the lymphatics of the peritoneum, making the surface of that membrane a secreting instead of an absorbing one, and also markedly increasing the secretion of urine.
6. The prevention of peristaltic movements of the intestines by withholding all food or liquids by mouth, and perhaps by the administration of opium.

You will notice that none of these essentials is absolutely new, for all of us have practiced one or more of them at different times on different patients. But while doing some of them we have omitted others and at the same time perhaps have done things that were unnecessary and harmful to the patient. Let me elaborate these points a little more fully.

First. In removing the cause of the peritonitis the less the peritoneal surfaces are handled the better, for nature has thrown out protecting lymph which inhibits the absorption of toxic substances and in handling such surfaces there is danger of bruising and rubbing off the lymph, opening up a new avenue for absorption and infection. Therefore Murphy believes that no attempt should be made to sponge the peritoneal surfaces or to wipe off any lymph that may be found, as such manipulation would increase the danger of septic absorption.

Second. When the patient is placed in the Fowler position the fluids in the peritoneal cavity will tend to gravitate towards the pelvis, and in addition the action of the diaphragm during respiration will help to pump the fluids in that direction, making drainage of the lowest part of the pelvis with a tube very important. If there is sufficient fluid in the pelvis to fill the tube, each excursion of the diaphragm will pump a certain amount of it out, which will be absorbed in the dressing. It must be remembered that it is not the quantity of fluid present which is harmful, but rather the extent of the peritoneal

surface which comes in contact with it, so that a quart of pus contained in a round cavity would be less dangerous than an ounce thinly coating over the peritoneal surface.

Third. It is well known that patients with diffuse septic peritonitis stand a short operation well but a prolonged one badly; therefore, when all one's energy is directed to at once removing the cause of the peritonitis, and all other procedures except drainage eliminated, an operation can be speedily completed, on an average, perhaps in six or eight minutes. This naturally permits of a minimum amount of anæsthetic, thereby directly decreasing the chances of shock and vomiting after operation.

Fourth. The advantages of the Fowler position are so well recognized now that it only needs to be mentioned.

Fifth. Murphy's method of introducing large quantities of water into the rectum is novel. He inserts a nozzle containing three or four openings into the anus to which is attached a rubber tube leading to a bag. This bag is filled with water and elevated but a few inches above the plane of the rectum, the idea being that the water shall just trickle into the rectum not much faster than absorption takes place. In this way from a pint to a quart of water should be allowed to trickle in during an hour, the process being a continuous one and the flow so regulated that no accumulation of fluid takes place in the bowel. In other words, an attempt is made to run the water in as fast as it is absorbed. The object of having more than one outlet in the nozzle is that in case flatus accumulates in the rectum it will pass out through one of the openings in the tube while the others continue to discharge the water into the rectum. When it is desirable to stop the flow of water the tube is disconnected from the nozzle, the latter remaining in the anus, thereby avoiding irritation to the anus by the constant removal and insertion of the nozzle and at the same time facilitating the passage of flatus.

By this method large quantities of water will be absorbed within the first few hours after operation. This absorption does two things: First, It reverses the current of lymph in the peritoneal lymphatics so that instead of absorption taking place from the peritoneal surface the mouths of the lymphatics pour

out fluid, bathing the peritoneum with this free discharge. The posture, together with the action of the diaphragm, constantly sends this fluid downward to the pelvis, washing away the infectious material from the peritoneum in its descent, and escaping from the pelvis through the drainage tube. Second, The free absorption of the fluid from the rectum stimulates the heart and kidneys, and largely increases the amount of urine passed, eliminating through this channel the septic material which has gained entrance to the circulation. After the ordinary abdominal section in a non-septic case the average amount of urine secreted in the first twenty-four hours is perhaps 15 ounces, and in the presence of sepsis it is apt to be even less. In the first case that I shall report this evening more than 60 ounces of urine was secreted in the first twenty-six hours.

Sixth. Stopping all food and liquid by mouth will check peristalsis and prevent the dissemination of septic material by peristaltic movements. The absorption of large quantities of fluid by rectum is quite sufficient to sustain the patient for forty-eight hours or more, but if the condition of the patient is so precarious that food seems a necessity, small quantities of it can be run into the rectum with the water.

As an example of the results obtained by this method let me relate briefly the histories of two cases; one representing the fulminating type of perforating appendicitis in which perforation takes place within a few hours after the onset of the first symptom, without protecting abdominal adhesions: the other a case of walled-off appendiceal abscess in which the abscess had ruptured into the general peritoneal cavity, where no adhesions were present.

CASE I.—A small, pale, thin married woman, aged 26, was admitted to the Bryn Mawr Hospital at 11 A.M., October 11, while in her third attack of appendicitis. The attack began the previous day at 8 P.M., with sharp abdominal pain, which gradually became agonizing, but which was suddenly much relieved at 4 A.M., the estimated hour of perforation of the appendix.

On admission the temperature was 100 2-5; pulse 112. An hour and a half after admission an incision was made through

the right rectus, and immediately on opening the peritoneum there was an escape of a considerable amount of purulent fluid with shreds of lymph floating in it. The appendix was ruptured, partially gangrenous and bound down at its base by rather old adhesions, but the remainder was without adhesion to the surrounding viscera. There was a general diffuse peritonitis, (no attempt at walling off), with occasional patches of lymph coating the intestines, while the head of the cæcum was much inflamed, intensely red and the peritoneum had lost its glistening character. The appendix was removed, a puncture made through the abdominal wall in the median line two inches above the pubis for the admission of a drainage tube which led to the bottom of the pelvis. Another drainage tube was inserted through the operative wound leading to the right iliac fossa, while the remainder of the incision was filled with loose gauze. No sutures were used. The duration of the operation was six or seven minutes.

The patient was placed in bed in the Fowler position and the rectal enema at once begun. During the first twenty-four hours the patient received $12\frac{1}{2}$ pints of salt solution through the rectum, not more than 6 or 8 ounces of which was expelled. The temperature ranged from 98 to $99\frac{3}{5}$, and the pulse came down to the 80's. She had a fairly comfortable night after $\frac{1}{6}$ gr. of morphia had been given hypodermically. During the first twenty-four hours the abdominal dressings had to be changed twice owing to their complete saturation with a colorless fluid of a slightly sour odor, and in the first twenty-six hours 65 ounces of urine were passed. On the third day a little water was given by the mouth for the first time, and from then on the fluids were rapidly increased. The rectal enemas were stopped at this time. No purgatives were given and on the fifth day the bowels moved twice naturally. The remainder of the convalescence was uneventful, the temperature and pulse remaining normal.

CASE II.—An Italian aged 37 was admitted to the Bryn Mawr Hospital October 14, having been sick five days. The attack started with severe general abdominal pain and nausea. The pain shortly localized itself in the appendix region, and previous to admission he had two chills, with fever and sweats.

On admission temperature was $102\frac{2}{5}$; pulse 120; respirations rapid; tongue dry; general appearance of typhoid condition.

The abdomen was opened through the right rectus and an appendiceal abscess was found, which had ruptured into the general peritoneal cavity, the pus welling up through the incision with each respiration. A gangrenous, perforated appendix was removed, and the drains arranged as in the previous case without sponging the peritoneum or even removing the excess of pus which was flowing from the wound. The operation lasted about seven minutes. While on the operating table his pulse was recorded at 200.

During the first ten hours 9 pints of salt solution were given by rectum, about a pint of which was not retained. Temperature dropped to $98\frac{4}{5}$ and the pulse varied from 100 to 80. He passed 900 c.c. of urine during the first thirty hours. As in the previous case nothing was given by mouth until the third day, when water was begun and the fluids rapidly increased. On the third day, without purgatives, the bowels moved twice. The rest of the convalescence was uneventful.

These two patients recovered without a single untoward or alarming symptom. The rapid falling of the temperature and pulse to normal; the absence of further septic absorption; the free elimination through the kidneys of toxic material; the absence of distention, nausea and vomiting, etc., lead me to believe that the favorable termination was directly due to the method practised.

EXTROVERSION OF THE BLADDER.

RELIEF BY TRANSPLANTATION OF THE BLADDER INTO THE
RECTUM.

BY B. G. A. MOYNIHAN,

OF LEEDS, ENG.

IN cases of extroversion of the bladder, no operation met with any noteworthy success until the work of Petersen had shown that by preserving the valvular termination of the ureter in the bladder, the transference of the ureters into the intestine was capable of being successfully accomplished. The most satisfactory application of this knowledge was made by Peters of Montreal. The old plastic operations of Wood and Ayres made the patients possibly a little more comfortable, but did nothing to relieve a condition which they, as well as their neighbors, felt to be revolting.

On March 11th, 1905, I was asked by Dr. Empey, of Cross-hills, Keighley, to see a youth, J. B., aged nineteen, who fifteen years before had had a plastic operation performed for extroversion of the bladder. Flaps from the lateral aspects of the abdominal wall had been turned over to the middle line until a sort of bridge had been formed over the upper part of the exposed mucous surface. The lower part of the bladder mucosa, however, that which bore the ureters, was still exposed, and urine therefore escaped on to the surface of the abdomen. It was there caught in the usual rubber receptacle, of pestilent odour, and drained downwards to the leg. The patient, with increasing years had become more painfully aware of the misery of his condition and begged to have something, anything done to relieve him of his terrible affliction.

On examining him I realized at once that the upper part of the bladder mucosa was healthy; that it might be preserved. I therefore decided not to transplant his ureters, but to transplant

his whole bladder, or so much of it as the operation might show to be vascular enough to transplant, into his rectum. It occurred to me that if a large area of the bladder could be grafted, so to speak, into the rectum, that the capacity of the bowel would be increased, and a veritable cloaca formed. My only doubt was that the vascular supply furnished along the ureters might be insufficient for a large area of the bladder. But in the operation I now describe I found that, when the edges of the bladder were trimmed with scissors, a free oozing of blood occurred from the cut surface. I therefore was able to transplant the entire bladder. The following are the details of the operation:

Operation.—The ureters were first catheterised. (Fig. 1.) Owing to the previous constant friction against the exposed bladder mucosa, which pouted exuberantly, this little manœuvre was by no means easy. A catheter was passed for 4 inches into each ureter and was fixed there by a single stitch which caught up the tube on one side and the bladder on the other. A vertical median incision was then made from the exposed bladder mucosa towards the umbilicus, the flaps which had been turned over to the middle line in the previous operations being completely cut through. On turning aside the flaps thus made the upper, previously covered, mucous surface of the bladder was exposed; it was found to be smooth, thin and entirely different in character and appearance from that of the lower exposed part. An incision all round the margin of the mucous membrane of the bladder was now made, between the mucosa and the skin, and the incision was deepened by degrees until a good thickness of the bladder could be raised up. The dissection from the margin of the bladder towards the ureters was continued, round the whole circumference, little by little. This was difficult in part owing to the fact that there was much scar tissue left from the former operations, in part because the great vascularity demanded frequent cessation to restrain the hæmorrhage by pressure. The separation above the pubes was most difficult, and here the prostate had to be separated with great care.

The purpose of this process of separation was to isolate the whole of the bladder, leaving only as its pedicle, so to speak, the two ureters. As much tissue was left round each ureter as possible, so as to avoid the possibility of damage either to the



FIG. 1.—Catheterisation of the Ureters. The Scars of the former flap operations are visible.

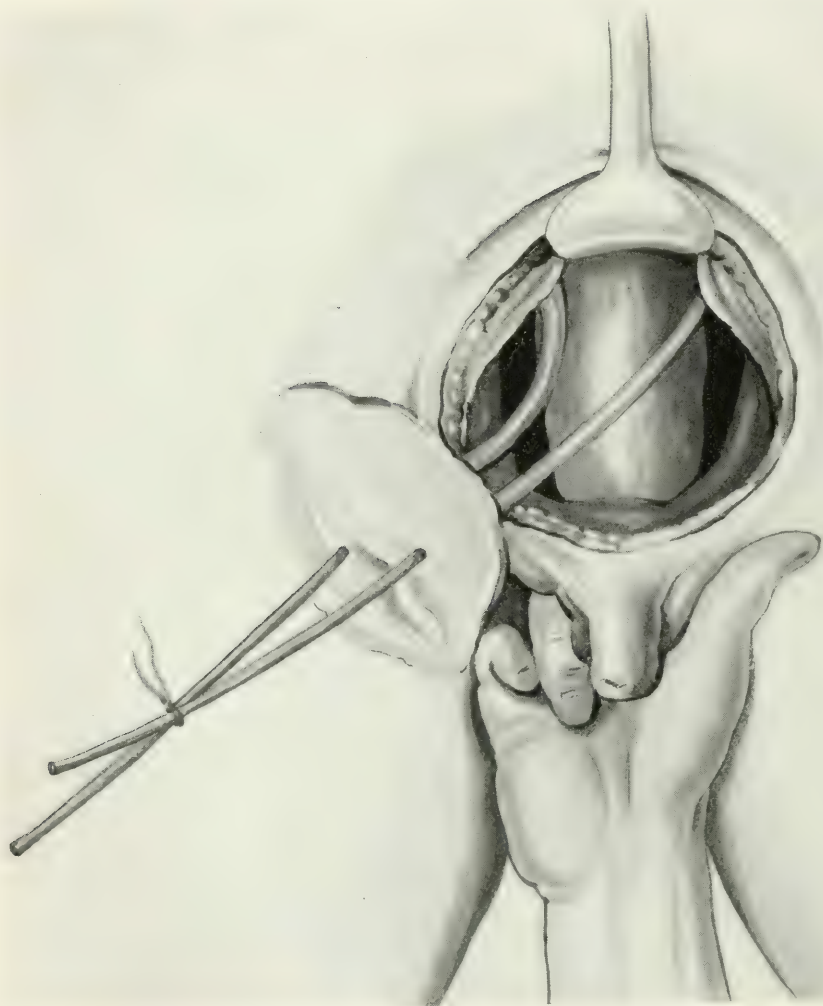


FIG. 2.—The Bladder Separated (in the actual operation, the ureters were not stripped so much as in the fig.

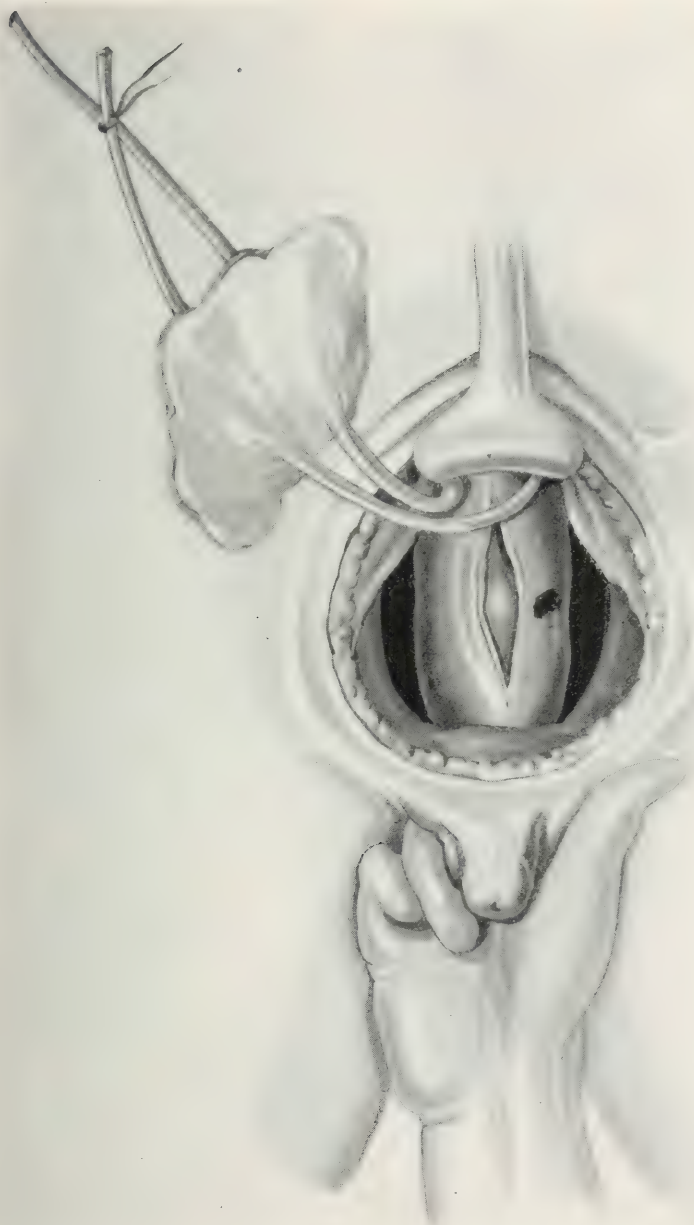


FIG. 3.—The return opened ready for the transplantation of the bladder.

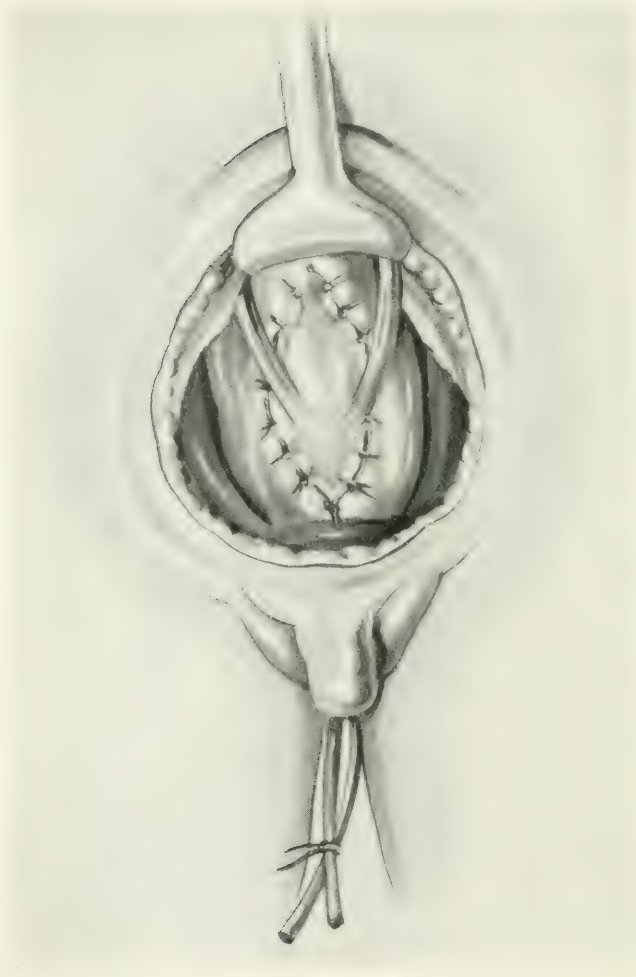


FIG. 4. - The transplantation completed.

ureter itself or to its vessels. In the annexed diagram (Fig. 2.) the ureters are shown clearly defined. This was not their condition during the operation; the figure is so drawn only for the purpose of making the details of the operation clear. As soon as the bladder was well isolated it was drawn upwards towards the umbilicus and there held by an assistant. In the bottom of the wound the rectum was now seen, and, above, the peritoneal reflection on to it. The serous covering was then stripped upwards from the front of the rectum until 4 or 5 inches of the bowel lay exposed at the bottom of the wound. In stripping the peritoneum up, a small rent was made into it, which was closed at once by a continuous catgut suture.

The finger of an assistant was now passed into the rectum to make it prominent, and along the anterior surface of the bowel an incision about $3\frac{1}{2}$ inches in length was made. (Fig. 3.) The upper and lower ends of this incision, and the mid-points of the sides were held with small vulsella, until a large opening was made. Into this opening the bladder was placed, being turned upside down so that its former anterior surface became posterior, and its former lower end became the upper. The ureters instead of passing forward to the bladder passed backward and the catheters passed into the rectum and out at the anus. The edge of the bladder and the cut edges of the rectum were now sutured together, by two stitches that were continuous, one taking the right side, and the other the left. (Fig. 4.) The sutures were passed after the manner of Lembert so that no mucous membrane was included in them. A few additional interrupted sutures were necessary here and there.

When the sutures seemed to be securely uniting the bladder and the rectum, the wound was dried and the skin edges along the original median incision were drawn together. At the upper end, the edges came well into apposition but about an inch at the lower part had to be left open. The catheters which had been introduced into the ureters now passed out of the anus; the sphincter had previously been stretched. The operation lasted an hour and a half.

The after progress of the case was satisfactory. The catheters remained in the ureters for four days, the urine being collected into a bottle. After their removal urine passed into the

rectum and dribbled out at the anus, which, owing to the stretching of the sphincter, as yet exerted no control. On the seventh day, a little urine began to leak by the abdominal wound, and this continued for a week. On the fifteenth day an anæsthetic was again administered, and the leaking point in the former line of suture discovered, and made good. From this day the wound remained absolutely dry, all urine escaped by the rectum and control gradually returned until at the end of a month it was perfect. Urine was then passed by the rectum about every two hours. The interval between the acts of emptying the rectum has gradually increased until now (Nov. 1905) the shortest period is three hours and the longest five hours. The urine is quite sweet and is normal on examination.

When the rectum is now examined the line of junction between the mucous membrane of what was the bladder and the mucous membrane of the rectum cannot be distinguished. All feels smooth and even and continuous. There is a fairly capacious cloaca.

NOTE.—The accompanying drawings were kindly made for me by Miss Ethel M. Wright.

TWO CASES OF RUPTURE OF THE BLADDER.

BY JOHN MARNOCH, M.B., C.M.,

OF ABERDEEN,

Surgeon to and Lecturer on Clinical Surgery at the Royal Infirmary of Aberdeen.

WITHIN recent years valuable papers have been published on intraperitoneal rupture of the bladder, notably by Alexander and Jones in *THE ANNALS OF SURGERY*, and from a review of the published cases some definite conclusions have been arrived at as regards the mechanism, clinical features and results of treatment of this rare accident. Since MacCormac, in 1886, published the first two cases successfully operated upon quite a number have been put on record and it is now quite clear that the prognosis with the advance of surgical technique is becoming more and more favorable. Thus, Jones in the fifty-four cases collected by him showed that the death-rate was forty-eight per cent. but that twenty-two of these fifty-four cases occurred during the last ten years and in them the mortality was only twenty-seven and a half per cent. This is all the more striking a tribute to surgical progress when it is borne in mind that the average time between the accident and the operation was longer in them than in those occurring previous to ten years ago. Two cases of rupture of the bladder have come within my experience and it has been thought desirable to add these to the few recorded since the publication of the papers mentioned above.

CASE I.—*Intraperitoneal and Extraperitoneal Rupture of the Bladder—Suture—Recovery.*—J. M., fifty-two years of age, by occupation a shipwright, was admitted to the Royal Infirmary, Aberdeen, on the 10th March, 1903, with the following history: At 1 P.M. on the previous day while ascending stairs he fell and struck the lower part of his abdomen on the edge of one of the steps. His complaint was that from the time of his accident he

had had pain over the region of his bladder and inability to pass urine. There was no sign of external bruising but the lower part of the abdomen was somewhat distended especially in the median line and on percussion the whole lower abdomen from about one inch below the umbilicus was dull as also were the flanks. Dr. Robertson, my house surgeon, passed a catheter without meeting any obstruction and drew off about three ounces of apparently normal urine, followed by a few drops of blood. As no relief was experienced the patient was once more catheterised, but this time no urine came away at all and as the pain and desire to micturate were still complained of and no difference was to be detected in the percussion dulness already referred to he was put to bed. Catheterisation after a lapse of two hours again brought away about two ounces of urine, followed by some blood. Dr. Robertson then resolved to try the injection test, and accordingly 13½ ounces of warm boracic lotion were run into the bladder by catheter, tube and funnel under strict antiseptic precautions and only four ounces could be withdrawn subsequently. Patient's temperature was 98° and his pulse was 96, occasionally slightly irregular but of good volume. He had no appearance of collapse or shock. A diagnosis of intraperitoneal rupture of the bladder was made and I was sent for with a view to operation.

Operation at 1.25 P. M., rather over twenty-four hours after the accident. An incision was made in the median line from the pubes upwards and the prevesical space opened first. From this region some blood-stained urine escaped from a small irregular tear just behind the pubes. Through the peritoneum fluid could be felt in the peritoneal cavity, which was accordingly opened and a large amount of blood-stained liquid escaped. With the exception of slight congestion of the intestines at the lower part of the abdomen there was no trace of peritonitis. The peritoneal cavity was mopped clean and an examination of the bladder instituted, when a small tear was found in the median line just behind the peritoneal reflection. The rupture of the viscus extended from just behind the pubes along the top to a point behind the peritoneal reflection referred to. This rupture had not penetrated the whole thickness of the bladder wall except at its two extremities. The extraperitoneal rupture behind the pubes was with great difficulty surrounded by a purse-string suture which was

then buried by a series of interrupted Lembert sutures. The intraperitoneal rupture was closed by a double row of Lembert sutures without difficulty. The abdominal cavity was thereafter mopped dry and after flushing copiously with sterile salt solution the peritoneum was completely closed as was also the rest of the abdominal wound except at the lower part where tube and gauze drainage leading down to the extraperitoneal rupture was employed. A soft rubber catheter was introduced per urethram into the bladder and tied in.

About 15 ounces of urine were passed by catheter during the rest of the day, but some came by drainage through the lower angle of the abdominal wound. The following day less came by catheter and more suprapubically, as his catheter was frequently found partially withdrawn from the bladder. In the evening his temperature rose to 101°F. and the patient began to show signs of delirium tremens. After a very restless night his temperature came down almost to normal and during the following day 35 ounces of urine came by catheter and very little suprapubically. This went on, sometimes a good deal coming by catheter and less the other way and *vice versa*, when it was discovered that the patient had been attempting at intervals to remove the instrument from his bladder from a few hours after the operation and eventually on the fourth day, he succeeded in extracting it altogether and absolutely refused to have it replaced. His restlessness and delirium never became violent and in five or six days disappeared. The subsequent history is that the suprapubic wound gradually closed and in ten days all his urine was passed per urethram. He was discharged well exactly a month after operation.

About this case there are many points of interest, but the chief are: In the first place, the extraperitoneal and intraperitoneal ruptures were not distinct and separate from each other but were simply the extremities of a median rupture in the vault of the bladder which had not in the rest of its course completely penetrated all the coats. Then, again, in dealing with an intraperitoneal wound of the bladder the safest practice after suturing is undoubtedly to pass a drain for a few days down to the neighborhood of the suture, but

here the circumstances were exceptional. I felt I could count almost to a certainty on the sutures of the intraperitoneal wound holding, but could not do so in the case of those of the extraperitoneal wound on account of the difficulty I had in getting them placed behind the pubes. Leakage from the latter, had intraperitoneal drainage been employed, would probably have infected the former and ended in disaster. The subsequent behavior of the patient in withdrawing the eye of the catheter from his bladder leading to distention of that viscus and leakage from the suprapubic wound proved the wisdom of the procedure adopted. The absence of peritonitis is noteworthy and once more explodes the old idea that peritonitis is set up as soon as urine escapes into the peritoneal cavity. In this case it was evidently due to the aseptic condition of his urine.

CASE II.—*Extraperitoneal Rupture of the Bladder and Hydatid Cyst of the Abdomen—Operation—Recovery.*—Mrs. M., forty-one years of age, was admitted to the Royal Infirmary, Aberdeen, on the 18th March, 1904, at 11.45 P.M. She stated that at 9 A.M. on the previous day she had fallen a height of ten feet, alighting on the left side of her pelvis and back and that since that time she had had continuous pelvic pain with frequent desire to urinate and the passage of very small quantities of blood-stained urine. She looked flushed and feverish, her temperature being 100°F; pulse of fair quality, 104, and respirations 20. On account of the pelvic pain she was unable to turn on her side. Her abdomen was moderately distended and did not participate in the respiratory movements. There was general tenderness with loss of resonance in the flanks and bladder region and tympanitic note elsewhere, while the liver dulness was completely abolished. Tapping the iliac crests produced slight crepitus and aggravated the pelvic pain. No abnormality could be made out on vaginal and rectal examination. Catheterisation of the bladder brought away eleven ounces of dark blood-stained urine and on trying the injection test the full quantity was recovered. About an hour after admission she vomited some bilious material.

It was evident from the condition of the abdomen that an intraperitoneal injury had occurred, but the exact nature of it I

could not determine. While extraperitoneal rupture of the bladder was thought probable, an intraperitoneal rupture, although not absolutely negatived by the injection test, was rendered less likely.

Operation 2 A.M. on the 19th March, forty-one hours after the accident. The prevesical space was first explored but no sign of rupture could be made out, and accordingly the peritoneal cavity was opened. After mopping out a quantity of blood-stained fluid a careful but fruitless search was instituted for injury to any of the contained viscera. The frequency of micturition with the passage of very small quantities of blood-stained urine pointed to a bladder injury, and in case a small intraperitoneal rupture had escaped observation I caused the organ to be distended with warm boracic lotion. It was then seen that the rupture was extraperitoneal, the injected fluid coming welling up from behind the pubes, but the site of the injury was so inaccessible that no attempt was made to apply sutures. There still remained the difficulty of accounting for the blood-stained fluid in the abdominal cavity so, once more, the viscera were systematically explored and at length a cyst was discovered lying retroperitoneally behind and rather to the outer side of the ascending colon, reaching from the cæcum below to the front of the right kidney above. This was enucleated by an incision through the peritoneum to the outer side of the large intestine and was found to be oval in shape, six inches long and three in diameter, with very thin gauzy looking walls and containing a clear limpid fluid. No further abnormality could be made out and the abdominal cavity was flushed with sterile salt solution and the wall closed except at its lower angle, where gauze drainage of the prevesical space was established. A flexible catheter was passed per urethram into the bladder and the patient sent back to bed.

Her subsequent history is that the blood-stained urine soon became clear, while the retropubic urinary fistula gradually closed, convalescence being retarded by the occurrence of some suppuration in the left labium and adjacent adductor region. She left the Hospital on the 18th July, 1904, quite well. Histological examination of the cyst proved it to be a hydatid. The patient was at first too ill to have a skiagram of the pelvic bones taken to show the site of the fracture and unfortunately this was omitted before her dismissal.

As in the other case, both an extraperitoneal and intraperitoneal injury occurred as the result of the fall. What the intraperitoneal lesion was is obscure, but a reasonable hypothesis seems to be that there existed in the abdomen another cyst similar to the one discovered, but which had ruptured at the time of the accident, the contained fluid escaping into the peritoneal cavity and setting up irritation with effusion. Assuming that the wall of the ruptured cyst was of the same thin, gauzy nature as the other, it cannot be wondered at that, when collapsed, it escaped detection. The combination of fractures of the pelvis in this case with extraperitoneal rupture of the bladder and the absence of fracture in the intraperitoneal case is in conformity with the general rule.

LOOSE BODIES IN THE KNEE JOINT.

WITH REPORT OF CASES.

BY F. GREGORY CONNELL, M.D.,

OF SALIDA, COLORADO,

Attending Surgeon to the Denver & Rio Grande Railroad Hospital.

THE Corpora Libera Articulorum, the Corpora Mobilia, the Mures Articuli, the Gelenkmaus, of the Germans; the Corps Etranger Articulaires, of the French, and the Loose or Floating Bodies of the English, have been classified into: *a*, Those in normal joints, or if the joint is diseased, this disease is the result of the presence of the floating body; *b*, those in pathological joints, being the result of such pathology.

But in many cases it has been difficult, if not impossible, to accurately determine with which of these subdivisions a certain body should be classed. In consequence, they have been divided, more practically, according to their composition, as follows:

1, Those consisting of foreign material, fatty tissue, fibrous tissue, fibrin, etc. 2, Those composed of bone, cartilage, or a combination of these two.

A transition of these bodies from class 1 to class 2 has been suggested, and undoubtedly this change does take place.

In class 1, perhaps the most important are the "Rice Bodies," "Melon Seeds," and the "Corpora Orysoidea," which as a rule indicate the tubercular nature of the change. These bodies occur not only in joints, but in tendon sheaths, and bursae, most frequently in regions other than the knee. They vary in size from $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, and in color, appearance, and consistency resemble boiled rice. Histologically they are found to be composed of fibrin and are practically structureless. They are supposed to be formed, by the exfoliation of particles of necrotic tissue, by a separation of villous or papillomatous growths from the

synovial membrane, followed by coagulation necrosis, or by the fibrinoplastic properties of the tubercle bacilli by which granulations are converted into fibrous tissue.

The lipomata in connection with the knee joint have recently received attention that has evidently been long due them, by numerous writers and especially by Hoffa¹ in his paper before the American Medical Association in 1904. In the cases reported in this contribution to the subject the bodies were of either bone or cartilage, and therefore the discussion will be limited to those bodies coming under that class.

According to Mueller,² Ambrose Pare, of ligature fame, in 1558, was the first to remove a loose body from the knee joint although its presence was unsuspected until the joint was opened for the purpose of draining an abscess. This particular body happened to be of cartilage, and hence the frequent use of the name "floating cartilage," many times regardless of its histological structure. In 1691, Pechlin was the first to describe the symptoms accompanying this condition. Subsequently cases were reported by Monro in 1726, Simpson in 1736, and by Morgagni in 1746, after which they were no longer considered a rarity.

In 1793 John Hunter³ considered these bodies at length, and theorized upon their formation in a paper read by Sir Everard Home, and published in Hunter's work entitled "The Blood, Inflammation and Gunshot Wounds." An unusual case is cited in which many such bodies were found in a pseudo-articulation following a non-union of the humerus. He then attributed their origin to the presence of small coagulæ of blood in the joint.

Rainey and Solly⁴ in 1848 presented theories as to the formation of these floating substances within the joint. After a careful examination of the bodies and the lining membrane of the joints, they conclude that the glands of the synovial membrane instead of secreting synovia, under some influence, produce cartilage instead, which becomes converted into imperfectly formed bone.

Since then many theories have been brought forward to explain the presence and the formation of such bodies, and

even at the present time these points are not definitely known. Among the following will be found the usual explanations:

a. A dry arthritis with an overgrowth of the margins of the articular cartilages.

b. Bony growths that have broken away from their attachments.

c. Infarction of the articular cartilage, with final separation of the infarct.

d. Plate of bone formed outside of the joint and then invaginated.

e. Chondrification and calcification of enlarged synovial villi.

f. An irritation and growth of embryonal cartilage and bone cells in the synovial fringes.

g. Concretions similar to biliary or cystic calculi, the nucleus being either a blood clot, a torn synovial fringe, a foreign body, a lipoma, or a piece of articular cartilage.

h. A portion of articular surface or semilunar cartilage broken off by direct injury.

i. A portion of articular surface or semilunar cartilage damaged by trauma, and subsequently becoming separated.

Trauma is considered by many authorities, notably by Barth,⁵ and by Vollbrecht,⁶ to be the cause of these bodies, but some observers, such as Sir George Humphry,⁷ doubt that they are ever caused by traumatism. It is certain that in many cases a history of injury is quite doubtful and in some instances absolutely negative.

Various experiments have been undertaken to determine the relationship existing between these bodies and a previous injury to the joint. Kragland⁸ found that upon the cadaver it was impossible to detach a fragment of articular cartilage simply by a blow; an area was loosened in this manner, but in order to separate it, a prying force had to be applied. Codman⁹ in a series of similar experiments arrived at the same conclusion.

But Burghard¹⁰ in 1892 found that an oblique blow upon the internal condyle, with the knee flexed, may, with some difficulty, cause a complete separation of a piece of the articular cartilage. Cornil and Coudray¹¹ in experimenting upon

dogs found that these bodies of traumatic origin became united to the articular extremity of the bone or to the synovial membrane. In one case eight days after the separation of a fragment of the articular surface of the bone, with chisel and mallet, this piece was found united to the condyle by an osseous bridge. H. Rimann¹² found the same result after conducting similar experiments upon goats and dogs. These experiments show that the influence of trauma in causing the formation of these joints is still *sub judice*.

The experiments of Kraglund and of Codman tend to substantiate the explanation offered by Koenig,¹³ *i.e.*, the traumatism injures and depresses a certain portion of the articular surface, and that this portion subsequently becomes detached by a pathological process, a fatty necrosis, called by Koenig "Osteochondritis dessicans."

Sir J. Paget¹⁴ described practically the same process and called it "Quiet Necrosis." Mr. Teale,¹⁵ at about the same time, mentions the same condition but without giving it a special name. Other names that have been applied are "Spontaneous demarcation," by Klein,¹⁶ and "Ostitis," by Kraglund.

Poulet and Vaillard,¹⁷ after a very complete and extensive study of this subject, arrive at practically the same conclusion relative to traumatism as an indirect etiological factor.

M. L. Harris,¹⁸ in discussing this explanation after drawing attention to the fact that Koenig's paper was written fifteen years ago, said: "There is almost no one who reports a case that does not reach the conclusion that Koenig was wrong." Still we find that Grüber¹⁹ has recently reported a case under the title "A Contribution to the Origin of Free Joint Bodies through Osteochondritis Dessicans of Koenig." Martens²⁰ makes an extensive report from Koenig's clinics at Gottingen and Berlin, including clinical and operative histories with microscopic examinations of the bodies removed. And in the present year, Koenig²¹ himself strenuously supports his previous position in a reply to the experiments and writings of Rimann and Cornil and Coudray.

In the absence of a positive history of injury the frequent occurrence of this condition in both knees, while

not excluding traumatism, does seem to render such an explanation less plausible. Bowlby,²² Clutton²³ and Weichselbaum²⁴ each records cases in which a loose body exactly similar in shape, size and position was found in the knee joints of both limbs. Bennett²⁵ explains the not uncommon involvement of both joints, as being due to the sprain or sudden twisting of the second joint which frequently takes place in the constant effort, made unconsciously, to protect or favor the joint first affected.

That these floating bodies of the joint are rarely of purely traumatic origin, was shown by Halstead,²⁶ who in 1895, after a careful review of the literature, found only three cases of this character, and one of these was doubtful. Koenig, Bruns, and many German authorities claim that spontaneous traumatic separation never occurs. But Burghard¹⁰ reports one undoubted case of this character and, while admitting their extreme rarity, mentions five similar ones that he collected from the literature.

Max Schüller²⁷ collected 143 cases of floating bodies in the joints and found that 85 were of distinctly traumatic origin, 39 were due to pathological changes, and 19 were unknown. But in these the question as to the direct traumatic separation of the fragment is not entered into. In many instances it is extremely difficult to determine the role played by traumatism. The movable body may lie dormant and not until there has been some injury to the knee do the symptoms present themselves. Or, in accord with Koenig, the osteochondritis dessicans may have all but separated the particle of articular cartilage when a comparative slight trauma completes the work.

The presence of a defect in the articular surface, approximately equal in size to the floating body, has been frequently noted. Instances beautifully illustrating the origin of these bodies from such defects are related by Codman⁹ and Lane.²⁸ Harris¹⁸ mentions a case in which the floating body accurately fitted into the defect, and the history of the case extended over thirty-two years.

The defect is usually situated on the internal condyle, because when the knee is flexed the patella does not protect

this in so complete a manner as it does the external condyle. But the external is sometimes injured, and MacCormack²⁹ mentions the case of Bruce Clark, in which the defect was on the articular surface of the patella. A discrepancy in the size or shape may exist between the body and the defect. This may be explained by a partial or beginning regeneration of the articular surface, or by a change in size of the detached fragment. Usually both of these factors will have been responsible for the lack of symmetry between the two.

The defect may be absent, owing to the origin of the body from some other source, or to a complete regeneration of the articular surface (as in Case II).

In a case reported by Wilson³⁰ in which he removed the body one year after the injury, critical examination of the condyles of the femur was negative, but on the posterior internal portion of the articular surface of the tibia, there seemed to be an irregularity which led to the surmise that this point was the origin of the body removed. Subsequent repair had largely obliterated any cavity that might have been made at the time of the accident.

This loss of substance in the articular surface of the bone even if corresponding, in size and shape, to the loose body does not necessarily mean that the latter originated from the former. Halstead²⁶ has brought out the point that the free body may possibly originate from some other source and then by pressure atrophy cause a depression in the articular surface, similar in size and shape to the movable body. In the case of Fairchilds³¹ a bullet was removed from the knee joint after having been in the joint or its neighborhood for many years. The foreign body had worn a groove into, but not through, the articular cartilage.

The history of these fragments after separation is another subject of much speculation. That they increase in size can not be doubted. Cornil and Coudray¹¹ mention two fragments that measured 7 mm. and 8 mm. in their longest diameter, but which measured 12 mm. and 13 mm. at the end of 1 and 1½ months. This augmentation in size they attribute sometimes to the production of fibrous tissue and sometimes to the

formation of new fibro-cartilage. Other explanations are that the increase in size is due to imbibition from the synovial fluid, to the deposit of layers of fibrin from the synovia, or to the deposit of lime salts. Poulet and Vaillard¹⁷ have shown that the fragment which at the time of its origin consists of bone and cartilage, becomes surrounded on all sides by cartilage, and that this newly-formed cartilage differs from the articular cartilage in being more embryonal and irregular.

In Wilson's³⁰ case the bone removed was found to have two surfaces covered with cartilage. The firm attachment to the tibia, and its vascularity, indicated to Wilson that it had formerly been much smaller.

Codman⁹ points out that the growth is chiefly in the cancellated bone, which may at times completely surround the cartilage, and in many cases that the cellular elements are still capable of being stained, which seems to point toward the activity of the osteoblasts. But to show that this power of the bone has not as yet been definitely determined we quote Codman; "*A priori*, however, one would think that growth by concretion and the slow deposit of lime salts would be more likely."

Cornil and Coudray¹¹ claim that one of the first changes noticed in all the traumatic foreign bodies was a disappearance, more or less rapid, and more or less complete, of the living cells of the bony portion of the fragment. Where there has been noted a reproduction of either the osseous or the cartilaginous cells the nutrition for this growth has been supposed to be derived from the synovial fluid. Barth⁵ thinks that the necessary nutriment is supplied through adhesions to the capsule. The pedicle, when present, has so often been found to be non-vascular, that a source of blood supply from this attachment is not to be expected. Yet Barwell³² thought that many of these bodies originated outside of the joint proper and likens the pedicle to a mesentery.

Blood-clots have undoubtedly become impregnated with calcium salts, and foreign bodies have been surrounded by osseous or cartilaginous material. For example, in the case of Shaw³³ the loose body was found to have, as a nucleus, a fragment of a needle. In this connection, Fairchild's³¹ case

is interesting, A Minié ball weighing 440 gm. was removed from the knee joint twenty-nine years after receiving a gunshot wound, but only three or four years after the onset of definite symptoms referable to the knee. In a personal communication Dr. Fairchild states that the ball was not covered with a deposit, neither was it bright, but of a dull, dead color.

The number of bodies that have been found within the joint varies greatly. They may be single or multiple and so frequent are they multiple that others should always be searched for. Bland Sutton³⁴ counted 1532 calcareous granules that were removed from a shoulder joint. Berry³⁵ removed 1047 from a knee joint from which, four years previously,³⁶ he had removed 50; he also mentions a case in which Mr. Thomas Smith removed 400 movable masses of cartilage from a knee. Barwell³² states that nine tenths of these bodies occur in the knee joint, with the elbow being the next frequent site, and Barth,⁵ in his classic work entitled "The Origin and Growth of Free Joint Bodies," found reports of cases in the knee, 55; elbow, 8; shoulder, 2; and wrist, 1. Paget¹⁴ mentions a case of the hip joint, and the articulation of the lower jaw has also been found involved. The ankle is rarely affected, but even pseudo-articulations are not exempt, as was seen in the above mentioned case of John Hunter's.³

Symptoms.—The symptoms may be very marked, significant, and to a degree almost pathognomonic. The most characteristic symptom is undoubtedly the sudden occurrence of severe sharp shooting pains in the joint, frequently so severe as to cause syncope. And with this pain there is a "locking" of the joint, *i.e.*, an inability to flex or extend the limb. The leg is usually slightly flexed, which is perhaps due to the interposition of the floating body between the articular surfaces, or between the bone and the capsular ligament. Reichel³⁷ is of the opinion that the body is never caught between the joint surfaces themselves, and cites the case of Lawson in which operation was performed during the attack, and the body was found in this position. In Case I of this series the operation was performed while the joint was locked and the body was found between the capsule and the joint surface. (See Fig. i).

In Case IV (Fig vii) the movable cartilage seemed to occupy a relatively similar position, yet at no time was there locking of the joint. In this case the exact relations of the body were not determined by operation; the body may have been external to the capsule, possibly passing through a tear in the capsule at the time of the injury.

The larger the body, the less acute are the symptoms,



FIG. 7.

although in cases where the large body exists the attack of pain, while not so severe, is more continuous. This is well shown in Case III, in which the bodies are extremely large. The pain had increased with the increase in size though a locking with its accompanying paroxysm had not occurred in many years.

The locking may last for a variable time, from an instant to a day or two. An acute synovitis usually follows and may persist for a number of weeks. Occasionally the synovitis may be absent, if the locking has been of very short duration. These attacks occur at irregular intervals and generally during the interval the joint is approximately normal.

With the presence of a palpable mass in the joint, or in connection with the joint, the above symptoms will lead to an accurate diagnosis, but on the other hand, with the absence of any visible or palpable mass in the neighborhood of the joint, differentiation from the other causes of "Internal Derangement of the Knee" will be arrived at only with great difficulty, if at all.

The different pathological conditions that may be included under the caption "Internal Derangements" have been classified, according to their frequency, by Tenny³⁸ as follows: Tabs from lubricating apparatus; Erosion of cartilage; Damaged and displaced semi-lunar cartilages; Ruptured ligaments; Free and loose bodies; Villous and papillary synovitis.

Damaged or displaced semi-lunar cartilages are perhaps the most frequent condition confused with the free or loose bodies. This condition was first described by Hey,³⁹ of Leeds, England, in 1803, and was called "Hey's Internal Derangement of the Knee." It was treated by splints, supports and appliances. In 1885 Mr. Annandale,⁴⁰ of Edinburgh, followed closely by A. W. Mayo Robson,⁴¹ of Leeds, operated for the relief of this condition.

With the adoption of the radical cure, abnormal semi-lunar cartilages have been assuming a position of more importance. As showing the relative frequency with which these two conditions are encountered, Allingham⁴² found 12 cases of loose body and 35 cases of pathological condition of the semi-lunar cartilages in 59 cases operated upon for internal derangement. In 33 operations of this character performed by Robson,⁴¹ 21 were for damaged semi-lunars and 12 for free bodies in the joint. In 106 cases of internal derangement which came to operation, Bennett²⁵ removed the semi-lunar cartilages 80 times and loose bodies 16 times. In 505 cases of recurrent effusion of the knee joint the same author found

obvious symptoms of loose body in 21 cases. That the differential diagnosis between these conditions is at times most difficult will be shown by the following case reported by Hubbard,⁴³ which had been examined by many men and was frequently diagnosed as a slipping cartilage. The patient was seen by Dr. R. F. Weir, of New York, who, after a careful examination and a knowledge of the history of the case, was of the opinion that the inner semi-lunar cartilage was the seat of the trouble and advised operation. At operation the cartilage was found to be thickened but this was not deemed sufficient to account for the symptoms. Manipulation of the limb allowed the escape of three unsuspected floating cartilages. Allingham⁴² cites a case in which his diagnosis of damaged semi-lunar proved at operation to be a loose body.

He gives as characteristics of damaged semi-lunar cartilages: *a*, distinct history of traumatic origin; *b*, well defined site of pain, either internal or external according to the cartilage damaged; *c*, no foreign body palpable; and *d*, no creaking in the joint.

Cotterill⁴⁴ makes the point that in damaged semi-lunars full extension is painful, while full flexion is painless. The X-ray may be of value, in that loose bodies will practically always contain bone, and therefore cause a shadow, while the separated semi-lunar, being of cartilage exclusively, will not show in the skiagram.

Under the title "Treatment of Puzzling Knee Affections" Hoffa⁴⁵ mentions the cases that were hitherto called "Neuralgia of the Knee," and states that many such cases are due to certain definite pathological changes within the joint, among which he includes free bodies.

In reporting four cases of "Contusion and Laceration of the Mucous and Alar Ligaments and Synovial Fringes of the Knee Joint," Flint⁴⁶ mentions a very instructive instance Case IV, in which at examination there was a sensation of something slipping beneath the fingers in the swollen region. At operation, the mucous ligament was found free in the joint with a thickened jagged margin. On manipulating the joint this reddened area comes to be between the outer margin of

the patella and the condyle of the femur, and corresponds to the mass felt to slip beneath the finger before the operation.

Indications for Operation.—After the diagnosis is fully established there is no question but that the joint will continue to cause trouble until the offending body is removed. There is always a possibility that the free body may become attached in some cul-de-sac in an out-of-the-way location, and give rise to no further trouble, but such a fortunate contingency rarely occurs in actual practice. If the body is in such a location and giving rise to no disturbance it should not be disturbed. They should not be removed merely because they are present, but because they are causing symptoms and disturbing the function of the joint.

In case of doubtful diagnosis, rest, splints, massage, etc., should be judiciously tried before advising operation. Exploratory incision of the joint is allowable in certain cases. Allingham,⁴² in 59 cases operated upon, found nothing abnormal in 3 instances. Bennett²⁵ made an exploratory incision 12 times in 106 operations and in 5 of these nothing was found to account for the symptoms, but in 2 of these 5 the exploration was followed by relief of the symptoms. Goldthwait⁴⁷ advocates incision and explorations not only for the various causes of internal derangement, but also in doubtful cases for diagnosis. The cases of Flint⁴⁶ were operated upon for exploratory purposes. Absolute diagnosis was not possible, but it was highly probable that some lesion would be found.

Treatment.—The treatment should be the removal of the offending body. The old classification into treatment by (a) direct incision, and (b) indirect incision, is no longer of practical value, and the second subdivision only of historic interest. Under perfect aseptic environs the operation is practically devoid of danger. The fact that there is danger in the opening of a large joint like the knee is established beyond cavil, but that the danger has been practically removed when operating under favorable circumstances is also well recognized. The joint must be approached with as much care and

solicitation as when we invade the peritoneal cavity. These two serous sacs, the peritoneal and the synovial, are similarly susceptible to infection, with the peritoneum being more tolerant. The power of the peritoneum to take care of a certain amount of infection is well known. The serous lining of the joint cavities is not so resistant. The absence of a structure analogous to the omentum, "the policeman of the peritoneal cavity," may account in part for this difference. This well-known lack of resistance of the joint makes it necessary to exercise the utmost caution in the operation.

As showing how much disturbances may be caused by invading a large joint even though no sepsis is present, J. H. Barbat,⁴⁸ reports a case in which, 48 hours after the removal of a large body, there was great pain, pulse 120, temperature 101 F., with the knee swollen and tender. He removed a skin suture and allowed about two ounces of bloody serum to escape, which on culture media proved to be sterile. More serum was removed two days later, and on the twelfth day the condition was normal. General anesthesia is not always necessary, and the employment of infiltration anesthesia should be considered, if not used, in every case. In Case I the body was removed in a manner perfectly satisfactory to both patient and operator after infiltration with a solution of eucaïne lactate gr. 1 to the ounce or normal salt solution, to which was added gtt. 4 of adrenalin chloride 1-1000. Houghton⁴⁹ removed a floating cartilage from an extremely neurotic individual after a similar analgesia and even tapped the articular surfaces with a knife without any objection being made by the patient.

The incision of the skin and that in the capsule of the joint should be on different planes, as a safeguard against the extension of a possible superficial infection from without inward. The incision should be located so as to expose the body to be removed and at the same time permit of an examination of the corresponding condyle of the femur. The incision generally employed is longitudinal at either side of the patella but this is not always sufficient to secure all of the bodies especially if they happen to be numerous, situated behind the condyles, or attached. In some cases a more exten-

sive operation, with transverse division of the patella and complete exposure may be necessary, as in the case of Lords⁵⁰ in which he removed ten bodies. Sir William Banks⁵¹ removed 40 after incising the tendon of the quadriceps and turning down a lower flap which contained the patella. These more serious operations are fortunately but rarely indicated.

The gloved finger may be used to palpate the articular cartilage. In this manner partially detached fragments have been discovered and removed, saving the patient from the necessity of a future operation. In dealing with the knee joint the "fingerless" operation has been insisted upon by many authorities, such as Koenig and Hoffa, but since the introduction and use of rubber gloves, which are essential, it would seem that the objections to digital palpation of the articular surfaces have been overcome.

These floating bodies of the joints are aptly called "gelenkmaus" by the Germans, because of their liability to disappear during the anesthesia or the operation unless such a contingency has been considered and measures taken to prevent it. The suggestion that a needle be passed through the skin and the body in the joint is not always practicable. Elastic constriction of the limb above and below the floating cartilage usually prevents it from slipping into the joint and out of sight at an inopportune moment.

The results following the removal of these bodies show a marked improvement, due without question, to the introduction and practice of aseptic surgery.

Paré² was the first (1558) to remove a loose cartilage from the knee joint, after which, removal by direct and indirect incision was performed with increasing frequency. In 1860 Larry⁵² collected all of the cases up to that time, 170, of which 117 were successful, 33 died, and 20 were failures. Nine years later Benndorff³² collected 169 cases, 109 with success, 46 deaths and 14 failures. Barwell³² found 88 cases between 1860 and 1875, 73 successful, 5 deaths and 10 failures. The failures were ineffectual attempts to operate by the indirect or subcutaneous incision of the capsule, which method has been obsolete for many years.

Müller² in 1886 gathered 190 instances of operation for

the relief of this condition, with 96 per cent. recoveries and 4 per cent. deaths. Woodward⁵³ up to 1889 found 104 cases with six bad results, 2 amputations and 1 death. Marsh⁵⁴ mentions 72 instances of operative removal of these bodies between the years 1885 and 1895 with no deaths and 10 failures. During these same years Bolton⁵⁵ states that no fatal results has been recorded. Cloudot⁵⁶ found no death from an operation for this condition reported since 1877. Tenny³⁸ in 1904 found 297 cases since 1895, with no amputation and no deaths.

These late statistics are certainly interesting and encouraging when compared with the words of Benj. Bell⁵⁷ who, in 1787, while speaking of those bodies in the knee joint that are not freely movable said: "In this case I would advise *amputation of the limb*. The remedy is no doubt severe, but it is less painful as well as less hazardous, than the excision of any of these concretions that have been attached to the capsular ligament."

REPORT OF CASES.

CASE I.—D. S., male, forty years old, miner, Irish. Previous History: Fracture of right leg above the ankle about eight years ago, recovery perfect. During life he had received many more or less severe sprains, bruises and falls; and in his occupation he had frequently injured his knees, but had no recollection of severely injuring either joint. Present illness began about eight months ago, with an injury to his left knee. While timbering, in a crouched position, his right knee on the ground with the left limb abducted and semi-flexed, the foot on the ground and the knee about six inches above the ground, the force of his blows upon the timbers dislodged some particles of rock and a piece weighing about four or five pounds fell a distance of about ten or twelve feet, and struck his left knee, bringing it forcibly against the ground.

He experienced severe pain in the knee and the entire limb but in about an hour he was able to ride (horseback) to his home. After nursing the joint for a few days, he was able to walk about, but with a decided limp, due to the stiffness and soreness which remained for some weeks. About a week after the accident he consulted a physician who treated him for rheu-

matism; he became no better, and since the injury the knee had been weak and unreliable, allowing him to work only a few days at a time. The joint was always sore and painful, but at irregular intervals there was a sharp shooting pain with a locking of the joint, lasting a variable time from an instant to half an hour. After these attacks of acute pain, the knee was swollen and tender to touch and painful upon motion. Hot application usually relieved the pain and reduced the swelling.

Six months ago, after one of these attacks of locking of the joint, he noticed a swelling located upon the inner aspect of the knee, at about the lower edge of the patella. Two months ago, after a like attack, a similar swelling appeared about an inch above the head of the fibula. These swellings were about the size of an ordinary bean, hard, immovable, and very tender; they remained visible for about three or four hours in each instance and finally disappeared without the knowledge of the patient. Hot cloths were applied each time, and caused relief from the pain. On February 6, 1904, while splitting wood, he slipped, twisted his knee, and had another attack of acute pain but much severer than the preceding ones. He dragged himself from the yard into the house, and on examining the knee, found a swelling a trifle larger than the previous ones, in the same location that it had assumed at the last attack, *i.e.*, above the head of the fibula. (See Fig. I.)

The writer was called, and examined the joint about one hour after the onset of the attack. The joint was not swollen, mensuration showed both joints to be of the same dimensions, there was no fluid in the joint, the limb was flexed at almost a right angle, the motion was very limited and painful. The entire left knee was very tender, though the pain at this time was greatly lessened to what it had been, hot applications had been continuously applied. The greatest tenderness was in the neighborhood of the small swelling, pressure upon which caused exquisite pain. This mass, a trifle larger than an ordinary bean, was immovable, very hard, and the skin which was not reddened, moved freely over it.

A diagnosis of floating cartilage was made, and its immediate removal advised, but the patient would only consent to operation, on the following day, if the symptoms did not disappear in the



FIG. 1.

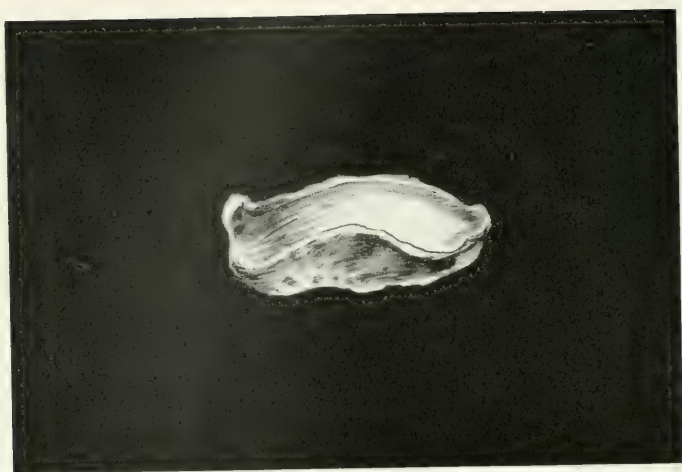


FIG. 2.

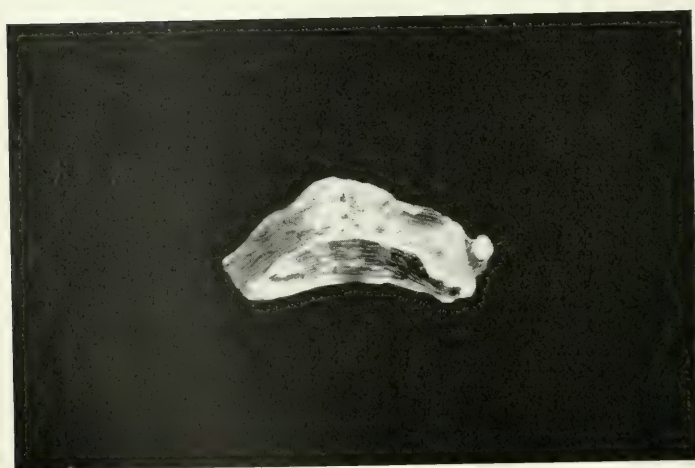


FIG. 3.

mean time. Consequently a hot moist dressing with a posterior splint was applied. On the following day, as the conditions were practically the same, the patient was removed to St. Vincent's Hospital. Operation February 7, 1904, assisted by Dr. J. A. Jeannotte. After the usual preparation and before the incision an elastic band was applied around the knee, above and below the body to be removed, to prevent it from slipping into the joint during the maneuvers that might be necessary in its removal. Anesthesia by infiltration, with eucaine lactate gr. i, normal salt solution oz. i, adrenalin chloride, 1-1000 gtt. 4 was perfectly satisfactory.

An incision one inch long was made parallel to the long axis of the limb over the tumor, which was situated an inch above the head of the fibula. Skin fascia, and capsule of the joint were all divided and the mass of cartilage was grasped with a sequester forceps and easily delivered. It was then found to be attached by a membranous pedicle, this was ligated, divided, and the cartilage taken away. The capsule was sutured with plain catgut, and the skin with silkwormgut. A collodion dressing applied and the limb put up in plaster paris.

On the seventh day the plaster bandage was taken off and the stitches removed, on the tenth day the patient was discharged from the hospital, with the normal function of the joint. The body that was removed (see Figs. II and III) measured 1.5 cm. in length, .5 cm. in thickness, and .5 cm. in width. Its external surface is convex, bony and rough, with many indentations; the inferior surface concave, bony, and .5 cm. broad; the superior surface is convex, bony and narrow terminating in a distinct ridge. The internal surface is flat and covered with a layer of cartilage about 1 mm. in thickness. At one extremity of this body, the one to which the pedicle was attached, there is found a distinct particle of bone about 1 by 3 mm. in size, and this is held to the larger fragment by the cartilage in which it is embedded.

Two months after his discharge, Mr. S. informed me that he had been entirely well up to a few days previous, when he had an attack very similar to those with which he suffered before the operation, with the exception that the pain was not so severe. A small swelling, about half the size of the body removed, presented

itself at the inner and lower aspect of the patella, the location in which he first noticed such a swelling about eight months previous. This swelling was noticeable for about half an hour, and the soreness of the joint was practically all gone the next day. He was told that there was certainly one, and perhaps more such bodies as had been removed still in the joint, and that the next time one presented itself he should come to the hospital at once and have it removed.

Four months later the patient again presented himself and reported that the knee was bothering him considerably. He said that he could feel a swelling down deep in the muscles of the upper portion of the calf of the leg. A few days before his visit, it had returned to its old location, at the inner and outer border of the patella, and had remained there all day, but the following morning it had disappeared and he felt much better. Examination of the knee at this time, was absolutely negative, the joint was apparently normal. The cicatrix of the operation was barely visible and caused no inconvenience.

CASE II.—J. G., male, forty-two years, switchman, American. On March 4, 1904, a locomotive ran over his right leg. He was immediately removed to St. Vincent's Hospital, where an examination revealed a crushing injury to the bones and soft parts of the right leg, which necessitated an amputation above the knee joint. Upon opening the knee joint a large floating cartilage popped out. This body (see Figs. IV and V) resembles a pumpkin seed in size and shape, it is 2.5 cm. long, 1.5 cm. wide and .5 cm. in thickness. One surface is hard, bony, and very rough and corrugate, with many large and small eminences and depressions. The opposite surface is slightly convex, its edges are raised and fluted, and the area within these raised edges is smooth and covered with a thin layer of cartilage. One pole of this body is broad, and the other comes to a point, and at this point there is attached, by a fibrous band, a very small spherical solid mass, in structure apparently similar to the bony part of the larger body. This small body is about 2 mm. in diameter and resembles a mustard seed. The joint was very carefully examined, but beyond a thickening of the synovial membrane there was nothing abnormal. The articular surfaces gave no clue as to the origin of the body.

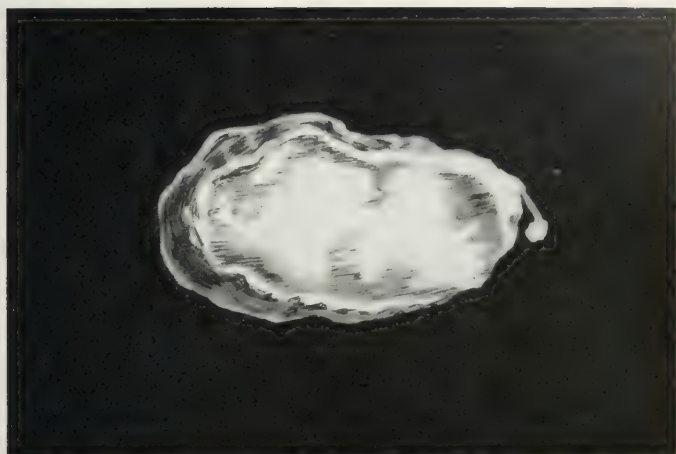


FIG. 4.



FIG. 5.



FIG. 6.

Upon inquiry, after the patient was convalescent, it was learned that he had, for many years, suffered with "rheumatism" of the right knee. He frequently had sudden attacks of sharp shooting pain in the joint, that would almost cause him to faint. With this intense pain, he could not move the joint nor even rest his foot upon the ground, but would have to lean against some stationary object until the pain had passed away. On more than one occasion he failed to catch a switching engine or car, because of this sudden pain which would make it impossible for him to move. In duration these attacks were always short. He never noticed any marked swelling of the joint, and after the attacks had passed away, he could go about his work as before, except that there would be some lameness, and that the joint might be sore and tender for some hours or days. He never had any trouble with the other knee, or any other joints. There was no history of any distinct traumatism.

A striking feature common to those two specimens is the smaller bony mass in connection with each. In review of the literature obtainable, reference to such small adherent particles is not found. Their significance is obscure; it would seem that they might be the origin of an additional body, and in the first case reported, where there was more than one body this explanation might seem tenable, but in the second case, it would seem that there had been ample time for a more advanced development of this second body. The presence of these smaller bodies in these two instances may be merely a coincidence, but if they are met with more frequently, they may be found to have a bearing upon the question of the formation of these floating bodies in the joints.

CASE III.—T. T., male, aged forty-one years, policeman, American. Previous History: Had most of the diseases of childhood, and "chills and fevers" when a youth in Missouri. When thirty-two years of age, had a severe attack of inflammatory rheumatism; all of the large joints were involved, the knee no more than others, with which he was confined to bed for six weeks. In his thirty-third and thirty-fifth years he had similar attacks of rheumatism, each of which lasted about six weeks.

Since then he has not been troubled with rheumatism or any other form of sickness. Present illness.—When fifteen years of age, he was riding horse-back, dismounted to open a gate, and in again mounting slipped and fell, but grasped a tug of the harness and was dragged along the ground head foremost for a distance of about twenty feet. He did not seem seriously injured, but there was a small triangular cut over the center of the right patella, as he remembers it this cut extended to the bone. The knee was somewhat swollen and slightly painful for a few days, during which time he remained in bed, and local applications were applied. In a week or ten days he had entirely recovered from the accident and was using the joint as usual.

About six months after this accident, he had his first attack of locking of the knee joint. While walking, feeling perfectly well, he experienced a severe sharp shooting pain in the right knee, which caused him to sink to the ground; he could not move the joint, but this pain and inability to move the joint soon passed away, and he was able to resume his walk. But there was considerable soreness remaining in the joint for a few days. Since then attacks similar to this one occurred at irregular intervals, four to six in a year, for a number of years. They never necessitated his being confined to bed.

About five years after the injury to his knee, there being no injury during the interval, he noticed the presence of loose movable bodies in the right knee. It seemed to him that there were many bodies in the joint, behind and on each side of the patella. They were about the size of a pea and some of them as large as a bean. He could feel them grate against one another or against the bones of the knee joint, and at times they would "pop" quite loudly, and would then cause moderate pain. Since first noting these movable bodies, he has always had trouble with the joint, has had "rheumatism," and the joint is a perfect barometer, always increasing in pain before the coming of a storm. The longest time that this knee has caused him to remain in bed has been about four or five days, only a few times. He admits, however, that he has many times hobbled around when it would have been much better for him had he rested. The use of strong liniment and the application of hot flannel cloths generally relieved the acute pain, and he was able to put up with the soreness.

About four years ago, the joint became ankylosed for about five days; this is the only time that such an occurrence has taken place. At present there is an almost constant pain when the joint is in action, but when at rest there is no pain. The limb remains a trifle flexed at the knee, and there is a slight eversion of the leg. The gait is very good, considering the pathology within the joint; it may be plainly seen, in walking, that one joint does not move as freely as the other. The patient states that the pain in the joint is much worse now, since these bodies became larger, than it was when the bodies were small, but he has not had the acute attacks of pain, with locking, for many years. The duties of a policeman are performed without any great apparent effort.

Examination: Well developed and nourished man, head, thorax, and abdomen negative. Both limbs of the same length, patella reflex normal on both sides. Left knee normal. Right knee $\frac{3}{4}$ of an inch larger than the left. Extension perfect, but extreme flexion is resisted and causes some pain. There is slight abduction of the leg. Passive and active motions of the knee are accompanied by crepitus. There is an effusion into the joint; the patella floats, but the normal depressions above and on each side of the patella are not obliterated. Palpation reveals a hard, resisting, movable mass about one half the size of the patella, situated below the tendon of the quadriceps extensor muscle. This mass can be moved laterally and also up and down, but only a small distance in either direction. It is not sensitive. A smaller body, about $1\frac{1}{2}$ by $\frac{1}{2}$ inches can also be felt; this body is freely movable and can be made to pass from the median line above the patella to the center of the right lateral aspect of the patella. This body is quite sensitive, and with its movements crepitus can be distinctly felt and heard. Sometimes this movable mass becomes lodged behind some muscular or tendinous structures and cannot be palpated, but some few maneuvers on the part of the patient can usually bring it within reach of the palpating fingers again. These are the only movable bodies that can be palpated but the patient states that occasionally a swelling can be felt in the popliteal space. The internal portion of the head of the tibia seems to be uniformly enlarged, and the tibial tubercle, the attachment of the patellar tendon, seems to be

enlarged and extended laterally and superiorly, on each side of the patella. (See Fig. VI.)

CASE IV.—G. V., male, thirty-six years, laborer, Italian. Previous History negative. Present illness: Entered D. & R. G. R. R. Hospital, because of a simple fracture of both bones of the right leg at about the middle. In addition to the above, at examination there was found a swollen, tender and painful right knee joint. With the rest and immobility necessary in the treatment of the fracture the knee rapidly improved. After union of the bones and removal of the cast, the patient complained of some pain, soreness, stiffness, tenderness, and creaking in the joint upon motion. Examination of the knee revealed the presence of some fluid in the joint, a slight abduction with marked lateral motion of the leg, complete extension caused no pain, but flexion to a right angle caused pain, with crepitus that could be distinctly heard and felt. It was impossible to locate the seat of this crepitus, there was no acute pain with it, but when the leg was flexed the patient complained of pain which he located in the center of the popliteal space. On the external surface of the knee between the condyle of the femur and the articular surface of the tibia, there could be felt a mass about $\frac{1}{2}$ inch wide and $\frac{1}{4}$ inch thick. This was movable; when pushed toward the center of the joint it seemed elastic and would spring back to its former position. The up and down and the anterior posterior motions were limited. The mass was not tender, nor was there any pain complained of when it was moved. Operation for removal of the body was advised but refused. Under rest and counterirritation, with pressure, the fluid was absorbed, the motion became much better, the abduction less marked, and the crepitus almost absent. But the mass could be palpated in the same position.

In the absence of operation and a presentation of the specimen, the propriety of including this case with the others may be questioned.

The mass in this case was certainly a movable body, outside of the joint, but its origin must have been within the joint; either from the articular surfaces or from the semi-lunar cartilages. After a careful study of the case I am constrained

to class this with the three cases of Bennett's in which a piece of the semi-lunar cartilage is torn from its connections anteriorly and then pushed forward, in this manner producing a tumor readily felt under the soft parts. Usually when the semi-lunars are damaged they are forced into the joint, or retain their normal position. In these cases a part of the cartilages is forced outward, as is very well shown in Fig. VII, taken from Bennett.²⁵

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AN EXTERNAL METAL SUPPORT FOR DIRECT APPLICATION TO THE SHAFT OF A FRACTURED LONG BONE.

BY WILLARD BARTLETT, M.D.,

OF ST. LOUIS, MO.

DAVID J., a laborer, forty-five years of age, while working in a steel foundry on the 26th of December, 1901, was injured by a heavy steel beam falling across the left upper arm. A few hours later I saw him at St. Luke's Hospital in a condition of mild shock with a temperature of 98.6, a pulse of 80, and a respiration of 24. It was quite evident on first inspection that the arm had been about as badly damaged as was possible without it being completely severed from the body. On the anterior aspect was a large irregular wound through which one end of the humerus protruded, while the other extremity of it stuck out of a similar lesion on the posterior surface of the arm. The skin was torn for a distance of about two-thirds the circumference of the arm, the anterior wound reaching obliquely to the fold of the elbow, while the posterior extended longitudinally from the middle of the arm almost to the shoulder. More than half of the muscular substance seemed to be divided transversely and the bone, in addition to being the seat of a compound fracture as just mentioned, was also splintered for a short distance. The great vessels and nerves were not seen, though it is presumable that most of them escaped serious injury, since the pulse at the wrist and sensation over the lower arm and hand were practically uninterrupted. From the above somewhat inexact description, it will be seen, at least, that so much of the continuity of the member had been interrupted as to make the question of saving it a very grave and doubtful one. The patient was anæsthetized at once, the ends of the humerus squared off and united by a through and through wire, necessitating some two inches of shortening. All blood clots, shreds of tissue and dirt were removed, but no attempt at primary suture of the soft parts was made, owing to their crushed, devitalized condition. A

rubber tube was drawn clear through the arm, the anterior and posterior defects stuffed out with gauze, and a very large aseptic dressing applied. No attempt was made at any form of permanent splint, since it was found that the soft parts over the two extremities of the humerus had been so extensively damaged as to make it a matter of impossibility to encircle one or both of them in such a manner as to insure support. Hence, as I say, I contented myself with merely wiring the bones to keep their ends from further damaging surrounding structures, and devoted my efforts to averting a general infection until some form of mechanical support for the bones could be devised and applied. The day after the operation the patient's condition was satisfactory in every particular, and on the second day his temperature arose to 101.6, the highest which was recorded during his convalescence. Four days after the injury he commenced to suffer great pain in the injured member, and this persisted until the ninth day, when the parts were placed at rest in the manner now to be described:

With the arm flexed at the elbow I applied a plaster bandage which included the chest, forearm and hand, the upper arm being left free, of necessity. A steel arch anchored at one end in the plaster enclosing the chest, and at its other in the bandage around the forearm, was suspended just above the upper arm. Beneath this arch was placed a vertical rod, which had attached to its lower extremity the silver splint shown in cut No. 1. This rode upon the ends of the bone like a saddle upon a horse, and prevented their natural tendency to rise up out of the wound, while an extension of the vertical rod fitted between the ends of bone, thus keeping the apparatus from gliding toward shoulder or elbow. However, under the influence of this direct splint the free bony ends showed a decided tendency to point downward and project through the gap on the posterior surface of the arm. Hence five days later a silver wire was passed under each extremity and carried out through the anterior wound, to be attached to the steel arch above. After this was done the humerus remained absolutely rigid, there was no difficulty in dressing the large anterior wound by stuffing gauze in around the rod and the wires, the patient was occasioned absolutely no inconvenience by the apparatus, and except for tightening the wires as they

stretched the appliance caused us no concern during all the weeks that it remained in place. It is worthy of note that there was no more spontaneous pain after the application of the splint, although there had been a great deal before. Six weeks after the injury a new plaster bandage was applied, this time the arm



FIG. I.

straight at the elbow, but the silver splint and the wire swings were left in position. At the expiration of seven weeks the two silver wires which had held the bone up were removed, and I was delighted to find that there was now no longer any tendency for the splint to force the humerus downward, showing that there

must be a reasonably firm union of some sort. It was, however, not until eight weeks had elapsed after the injury that I ventured to remove the anterior silver splint, when, to my great satisfaction, it was found that there was a decidedly firm union, although at this time it cannot have been a bony one, for the bone could be slightly bent at the point of fracture. Three days later the bone suture was removed for fear that it could not remain without symptoms, in what had been for so long a time an infected wound. Though all supports of every sort were out of the wound and the bone was reasonably firm and seemingly in good condition, the arm was now apparently a shapeless and useless mass of tissues, so long had it lain in splints. The hand and fingers were so œdematous that the patient could not bend any of the joints in them, and hence our efforts from this time were to reëstablish the physiological functions of the part. On March 7th, that is, ten weeks after the injury, the patient sat up for the first time, and two days later the last cast was removed from the arm. On March 17th,—that is, almost twelve weeks after he was hurt, it was necessary to anæsthetize him and break up the adhesions which had formed in all the joints. It was possible to do this without disturbing the newly formed union at the site of fracture and as a consequence a considerable degree of motion was possible in all of these joints which had previously been stiff. On the 10th of April, fifteen weeks after the injury, the patient was discharged from the hospital. There was still some œdema of the hand, though all the wounds were healed, and he possessed something like half motion in all of the joints. Six months later I saw the man, and was gratified to note that he could feed himself, take off his hat and put it on, and otherwise perform most of the functions which are expected of a healthy arm. The amount of strength now possessed by the member cannot be better shown than by adding that he can carry a hod full of coal or a bucket full of water without discomfort and without the slightest evidence of movement in the shaft of the injured bone. Dr. Clopton has made an examination with the fluoroscope, and tells me that he found the bone ends in perfect apposition, the axis of the shaft relatively straight, and presumes, from the fact that an extremely heavy shadow was cast by the callus, that the union at that time must have been bony in nature.

It is of interest in this connection to review briefly the various methods which have been adopted for the accomplishment of a firm union in compound fractures or those which have failed to unite primarily. These may be best divided into two groups, the first of which shall include the various appliances which can be completely incorporated within the extremity, and the second group made up of those which communicate with the exterior of the part. Under the first heading come the various forms of wires, nails, screws, plates, etc. Boeckel was the first to use ordinary screws in approximating the ends of oblique fractures, and is said to have accomplished some very desirable results in this manner. A double nail was used by Gussenbauer. This was an appliance shaped somewhat like a broad letter U, and each extremity of it penetrated a half of the fractured bone. Some sort of an ivory or absorbable bone rod was inserted into the marrow at the site of fracture by Bircher, and Von Bruns. Senn introduced a valuable aid in the treatment of oblique fractures of the thigh when he proposed his bone rings a few years ago at a meeting of the American Surgical Association. So enthusiastic over this proposition was Rickets that he termed Senn's bone rings the most rational means yet proposed of treating this form of injury. Ivory plates were tacked or screwed to the fractured bone by Sick, while similar plates of silver or other metal have been used, and in many instances with excellent results by Agnew, Redard, Steinbach, Martin, and White. In some respects the most nearly physiological, hence, the most nearly perfect of all the appliances which have been incorporated into the structure of a fractured part, is a bony flap. This has been successfully performed by Wolff, Mueller and Scheuer. This last-named author transplanted a rib into the shaft of the humerus, dividing the pedicle fourteen days later, and in this way accomplished a perfect result. This practically completes the list of the heteroplastic and autoplasmic methods which have been advised for repairs of this kind.

Of the appliances which have held broken bones together, and at the same time communicated with the external world, but one has met with a marked degree of success up to the present time. I refer to Parkhill's clamp, which consists of

four parallel screw rods, two of them being driven through each portion of the bone and then held together outside the arm by wing-plates. The second appliance which I will mention as having a similar end in view is the one which I have presented herewith. The appliances to be incorporated will be passed with a mere mention since they have in reality no bearing upon the discussion at hand. In comparing these two methods, which contemplate an open wound and a communication with the exterior, I have no word of criticism for the Parkhill apparatus. The excellent results obtained by Parkhill, and with the same apparatus by Bennett, speak for themselves; but I will state that my appliance is decidedly the simpler of the two, can be quickly and cheaply made anywhere by anyone, and is certainly easier to apply than the other. It is surely not a very easy matter to drill four holes perfectly parallel, as must be done in applying the Parkhill apparatus. Again, the application of it takes some little time and must often be done during the shock which supervenes upon a serious injury, and last, but not least, the relation of the parts must be considerably disturbed in order to carry out the process.

As I have stated, it is a very simple matter to place my apparatus in position. All that is necessary is to square off the ends of the bones a very little, hang a wire under each, and place the little saddle upon them. Furthermore, it is extremely easy to remove the entire apparatus when its purpose has been accomplished. In the case at hand this was done without the use of any anesthetic, general or local, and the patient complained of no pain whatever. There was no necrosis as a result of pressure, and I must express myself as pleased in every way with the result accomplished. I claim further for this simple procedure a far wider field of usefulness than is possible where any of these other devices are used. The proposer of each of these others has been careful to state that a well-fitting plaster cast or other splint must be applied to the portion of the extremity injured in order that his apparatus may best subserve its function. Now, it will be remembered that in my case the soft parts were injured from the shoulder to the elbow, making it manifestly impossible to apply any sort of splints which might remain in position anywhere between

the two points mentioned. My only possible points of anchorage were the chest and the forearm; hence, it will be seen that the device here employed meets the requirements of cases in which all methods must fail which depend in any sense upon a permanent cast applied between the shoulder and the elbow. There is no reason why it cannot be used in a fracture of the thigh, or in one of any other long bone for that matter, and I especially recommend it in just those most extensively lacerated cases where an extremity might be lost or permanently deformed if any dependence had to be placed upon an external splint for the part.

THE USE OF WOLFE GRAFTS AND TENDON-LENGTHENING IN TREATING CICATRICAL CONTRACTURES.¹

BY CHARLES N. DOWD, M.D.,

OF NEW YORK,

Attending Surgeon to the General Memorial Hospital and to St. Mary's Free Hospital for Children.

WHEN the skin about joints is destroyed by burning or otherwise, the healing process is accompanied by contraction, and firm cicatricial bands are often formed which hold the members in distorted positions. The thumb may be drawn backward upon the forearm, the fingers on the palm or even on the dorsum of the hand; the forearm may be so flexed upon the arm as to be of little use; the foot may be inverted or everted so that the patient cannot walk on the plantar surface, and various other deformities may result. These cicatricial contractures are among the most annoying conditions which the surgeon has to deal with, since the force which caused the original contracture is apt to cause a new one when the first one is corrected. Many methods of treatment have been employed. A common one is to divide or dissect out the cicatricial band and hold the member in a splint during healing. If, after the dissection of the cicatrix, the edges of the skin can be brought accurately together without undue tension, the method gives a great gain; but in many instances they cannot be so brought together and the resulting contraction is almost, if not quite, as bad as that for which the operation was done. Thiersch grafts have been often used to cover the defects, but contraction still goes on. Wolfe grafts, which include the entire thickness of the skin, are also used, and the result is much better.

The six cases here cited have been treated by excision of the cicatricial tissue, the lengthening of tendons in some instances, and the use of Wolfe grafts to fill in the defect.

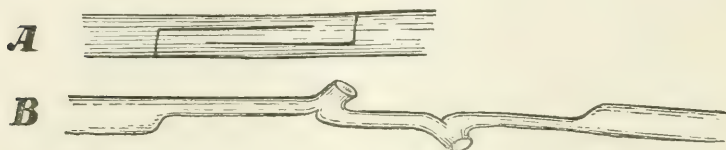
¹ Read before the New York Surgical Society, November 8, 1905.

It may not be amiss to call attention anew to the value of grafts composed of the entire thickness of the skin. Wolfe¹ of Glasgow, in 1875, used such grafts in the treatment of ectropion. Krause² of Altona, in 1893, presented before the German Surgical Society the results of operation in 21 cases in whom he had used grafts taken after Wolfe's method, but much larger than Wolfe had advocated and used in a much wider range of conditions. Some of his grafts were eight inches long and two and a half wide, and he used them for filling up large defects after extensive ulcers and bone necroses, after machinery accidents, face lupus, extirpation of tumors, etc. The method is very generally known by his name. In the twenty-one cases he made over one hundred grafts, and only four failed absolutely, although there were others in which there was partial failure, and he speaks of small necrotic spots as being quite common in the grafts. In his report of 1895 he emphasized the statement that these grafts were only to be employed when Thiersch grafts were not suitable. Many observers have reported on the method, among whom we may mention Henle³ and Wagner from Von Miculicz's Klinik in Breslau, and Widman⁴ from Nürnberg. The former reported fifty-one cases, among whom there were thirteen failures, eight partial failures, and thirty complete healings. The latter reported twenty-nine operations, with three absolute and two partial failures. The percentage of failures is so much greater than with the Thiersch method that it has not been popular; and Fowler probably expressed the general opinion of surgeons of the time when he stated in *Dennis' System of Surgery*, that these flaps are rarely used on account of the frequent failure of nutrition and consequent death of the flap. In the literature of the last few years one seldom sees reference to the method, although it is used by many surgeons in the few cases for whom they think it advisable. Among Krause's, Mikulicz's and Widman's cases the use of these grafts in cicatricial contractures of the finger and hand is referred to and Kennedy⁵ in 1899, reports two cases in whom he used them with marked success, and a third in whom failure was due to the changing of the dressings at home by a relative of the patient. In one of his cases he used a Thiersch graft on one finger and Wolfe

grafts on the other two. The Thiersch graft was followed by a severe recontracture, while the Wolfe grafts were followed by excellent results.

No report of tendon lengthening in these contractures has come to the writer's notice, although it must have been done many times. The method here used was that proposed by Hibbs⁶ for lengthening the tendo Achillis.

It is more rapid than making long diagonal division and sewing the ends together, and no stitches are left in the tendon. Whether fewer adhesions result is debatable.



HIBBS' METHOD OF TENDON-LENGTHENING.

CASE HISTORIES.

CASE I.—M. N., History No. 2, series 3, aged thirteen years, was admitted to St. Mary's Hospital, November 13, 1900. In early childhood she had received an injury from a pistol-hammer; this resulted in a contracture of the terminal phalanx of the right ring finger, which was drawn forward and outward and was firmly held at right angles with the rest of the finger; extension was impossible.

November 22, under ether, the contractile band was excised. The cicatricial tissue extended down to the capsule of the joint. The deep flexor tendon was so much contracted that it had to be lengthened, in order to extend the end of the distorted phalanx. The joint seemed normal. A Wolfe graft was cut from the thigh and sewed into the denuded area with fine silk stitches. Rubber tissue was applied and a firm protective dressing. This was left in place for two weeks; the outer dressing was then removed, leaving the rubber tissue in position. The dressing was changed at intervals of about a week until six weeks from the time of operation. The epidermis loosened from the flap and came away, but the true skin adhered to its position and was very firm. The motion in the joint remained good (see photograph). The

PLATE I. (CASE I.)



FIG. 1.—Cicatricial Contracture of Right Ring Finger; of ten years duration.



FIG. 2.—Photograph of Hand two years after operation. Posterior view.



FIG. 3.—Photograph of Hand two years after operation; Lateral View; Fingers extended.



FIG. 4.—Photograph of Hand two years after operation. Fingers flexed.

PLATE II. (CASE II.)



FIG. 1.—Contracture of Thumb and Hand, following Burn.



FIGS. 2 and 3.—Radial and Ulnar views of Hand, one and a-half years after the beginning of Treatment.

patient was seen two and three-quarter years after the operation; there was no return of the contracture and no loss of motion. She has since died of phthisis.

CASE II.—N. P. (History No. 1382), aged four and one-half years, admitted to St. Mary's Hospital, April 21, 1904. One year ago clothing caught fire and extensive burns of face, hand, forearm and abdomen resulted. The consequent deformity in the hand was excessive (see photograph); the thumb was drawn almost over to the flexor side of wrist and held by firm cicatricial tissue; in a similar way the little finger was drawn onto the palm, and the ring finger half way there.

April 29, 1904. The scar tissue was dissected away from the base of the thumb, the extensor tendons of the thumb, which were much contracted, were lengthened. The hand and thumb could then be extended nearly to their normal positions. After the edges of the skin were stitched there were two irregular defects in the skin, one $2\frac{1}{2}$ by 1 inch and the other about 1 by $\frac{3}{4}$ inch. These were filled in with Wolfe grafts, which were stitched into position with fine silk and dressed in the ordinary way.

May 11. First change of dressing. Grafts look well; bluish in color. Only slight discharge in the gauze.

May 20. Thumb in good position. Grafts have held firmly.

May 26. Sent from hospital on account of whooping-cough.

September 16. The thumb was found to be in good position and has several degrees of voluntary motion; the hand was still slightly flexed on the forearm. A cicatricial band was therefore divided and a graft, 2 by 1 inch, inserted on the flexor side of the forearm. The scar tissue was also dissected off from the proximal interphalangeal joint of the ring finger and a graft, $1\frac{1}{4}$ by 1 inch, inserted there.

October 10. These were entirely healed.

October 18. Little finger amputated, consent having been withheld before. After the healing of this wound she was treated by massage and her hand continually improved, but on January 5th, as there was considerable ulnar deflection of the hand, the cicatrix of that side of the wrist was incised, a part of it dissected away and a graft, $1\frac{1}{2}$ by $\frac{3}{4}$ inch, was inserted. This held well, and massage was again used; but on June 28th, as

there was still some ulnar deflection, another incision and dissection were made and a diamond-shaped graft, 2 by 1 inch, was inserted. This was well healed in place in five weeks and the patient sent home. The accompanying photographs were taken two and a half months later and show the deformity well corrected.

CASE III.—E. C., History No. 1664, aged 12 years, July 26, 1904. Hand was burned when he was a small child and a contraction has followed. The terminal phalanx of the left index finger is drawn forward, almost to a right angle, and held by dense scar tissue. The middle and terminal phalanges of the little finger are flexed upon the proximal phalanx which in turn is held backward toward the dorsum of the hand by firm cicatricial bands. (See photograph.)

Operation July 29th. Cicatricial tissue excised from flexor side of both fingers, deep tendon of index finger and superficial tendon of little finger lengthened. Grafts sewed in with catgut. Dressed in usual way.

First dressing changed August 6. Wound clean. Grafts look grayish-white.

August 20. Dressing changed: grafts have taken, excepting small area at the end of the one on the little finger.

September 3. A slight granulating spot at margin of little finger graft.

October 8. Discharged cured.

November 8, 1905. Presented before New York Surgical Society. Hand useful and shows hardly any practical disability. Extension of both fingers almost normal. Flexion in both little and index fingers about $\frac{2}{3}$ the normal. No voluntary motion in terminal joint of index finger. (See photographs.)

CASE IV.—M. C. (History No. 1965), aged four and one-quarter years. April 4, 1905. Three years ago (when sixteen months old) fell and cut palm of hand and base of index finger on glass. A contracture followed, which increased for a few months and has since been stationary (see photograph). The right index finger was found flexed at the proximal interphalangeal joint, and held by a firm cicatricial band which extended well into the palm. There were several degrees of motion at the metacarpo-phalangeal joint.

PLATE III. (CASE III.)



FIGS. 1 and 2.—Cicatrical Contractures of Index and Little Fingers of about ten years duration.



FIGS. 3, 4, and 5.—Photographs of Hand in Extension and Flexion one year after operation.

PLATE IV. (CASE IV.)



FIG. 1.—Contracture of Index Finger of three years duration.



FIGS. 2 and 3.—Hand in Extension. Flexion, six months after operation.

April 6, 1905. Cicatricial tissue dissected out. Just under the skin it was very firm and band-like. An elliptical graft, $1\frac{1}{4}$ by $\frac{3}{4}$ inch in size, was stitched into the defect. Nine days later dressing changed for first time; condition of graft good. Seven days again dressed; doing well. One month after operation graft of good color and firm. Three weeks later discharged with graft firm and several degrees of motion in finger.

Seen October 21, 1905. Finger held extended; no contracture (see photograph). She can flex it to a right angle, and when she does so the tendon can be felt in the palm and at the base of the finger. It is, however, adherent in the proximal phalanx of the finger, and gives no independent motion in the distal and middle phalanges.

CASE V.—S. C. (History No. 1838), aged seventeen years, congenital deformity of hands. (See photograph.)

February 16, 1905. Left little finger. The very dense band of fibrous tissue, which resembled that of the other cases, was dissected away and the finger straightened. A skin graft, $2\frac{1}{2}$ by $1\frac{1}{4}$ inches, was stitched into the defect and the usual dressing applied, with the finger in extension.

February 27. First dressing; doing well.

March 1. Second dressing; doing well.

March 3. Third dressing. Patient discharged from hospital, to be dressed by Dr. George W. Kosmak, who sent her there.

May 18. This finger was found to be nearly straight, with slight flexion at the terminal joint; held in slight adduction, ten to fifteen degrees of motion in each joint.

Operation May 18 on right little finger. Operation similar to that on left side. Two grafts were used; one kite-shaped, 2 by 1 inch, and one of irregular shape, $\frac{1}{2}$ by $\frac{1}{4}$ inch. First dressing, eleven days later; graft dry and clean, position of finger good. Patient referred to Dr. Kosmak for further dressing. Healing took place well. No other operation was deemed advisable, excepting the removal of the terminal phalanx of one of the fingers. The contractures were relieved and the healing of the grafts was satisfactory, but on account of the congenital defects, the resulting fingers were far from normal.

CASE VI.—J. N. (History No. 2100), aged seven years.

March 20, 1905. One year ago clothing caught fire and she was severely burned about the chest and left arm. The areas about the upper arm and chest were covered partly by a flap taken from the side of chest, and partly by Thiersch grafts, but the elbow was held flexed at a right angle by contractures which had formed in the early process of healing. (See photograph.)

June 26, 1905. A transverse cut was made at the flexor surface of the elbow and the skin was loosened about its edge. The arm was then extended. The resulting defect, 2 by $2\frac{1}{2}$ inches, was filled by a skin graft and dressed in the usual way. It was dressed eight days later, the graft showing the ordinary pale bluish color for that period of healing. One week later color good. A slight necrotic spot developed in the centre of the graft and a small spot of granulation at its edge. These were slow in healing as it was difficult to prevent the irritation of the forming scabs, even through the dressing.

She was however discharged from the hospital five weeks later in good condition and with good power of extension in the arm.

Seen four months after the operation: slight keloid about the edge of the graft and in a spot in its centre, but the skin is of good quality and firm and motion in elbow is normal.

In review we note that in the five traumatic cases the contractures were relieved and showed no tendency to recur after periods of, respectively, thirty-three, eighteen, fifteen, seven and four months from the times of the first operations. In the congenital case only the little fingers were susceptible of treatment, and these were greatly benefited. The left one, which was contracted backward so as to be not only useless, but an obstacle to the use of the hand, was changed to nearly a normal position, has several degrees of motion in each joint and is a useful member. The right one has been released from its constriction and might well have good motion, but for the congenital malposition of the parts. The grafts were all movable over the underlying tissues. Sensation was present in them; in some instances minute hairs were growing in them, and the skin was almost normal. There was a tendency to thicken-



FIGS. 1 and 2.—Congenital Deformity of Hand.



FIGS. 3 and 4.—Little Finger in Extension and Flexion. Eight months after operation.

PLATE VI. (CASE VI.)



FIG. 1.—Cicatricial Contracture of Elbow. Extension limited to about 90° .



FIG. 2.—Arm four months after operation; motion in Elbow normal.

ened scar formation about their margins in varying degrees, and in one case this extended into the substance of the graft, but in no instance was this enough to interfere with the free use of the adjacent joint.

The value of tendon lengthening also is of interest. It was done six times in this series: One deep flexor of ring finger at terminal joint. One extensor ossis metacarpi pollicis. One extensor prima internodii pollicis. One extensor secundi internodii pollicis. One deep flexor of index finger. One superficial flexor of little finger.

In the first case the resulting motion was practically normal. In the extensors of the thumb the resulting motion was about half the normal, limitation in extension being apparently due to a cicatricial band in the middle of the wrist and palm, which had not been sufficiently divided. The result for the superficial flexor of the little finger was apparently good, but it was difficult to distinguish the action of the deep and superficial tendons. In the last instance the lack of voluntary motion in the terminal joint indicated that the lengthened tendon was so adherent as to give no independent motion.

These results are surely sufficiently good to warrant the further trial of these two elements in relieving these contractures. They are surely much better than the author has seen from other methods.

In estimating the value of the procedure, we must manifestly consider the difficulty in securing union in the grafts. This difficulty has been sufficient to make the "entire skin" method of grafting unpopular. With the small grafts which are usually needed for contractures, however, and the clean surface which can be obtained, there is little difficulty in obtaining union. In this series every graft held well. If we include in the series a failure of a graft in a contracted ankle, where an ulcer was present and the tissues were very poorly nourished we still have ninety-three per cent. of successes. Operation for these cicatricial contractures can almost always be done in well nourished tissues, and without the presence of ulceration, and we may confidently expect the graft to hold in almost every instance.

Technique.—There are some points about the technique which are important. Aseptic operation without the use of germicidal solutions is desirable; also hæmostasis, when possible by pressure, without the use of ligatures. The grafts may be held in position by small silk stitches, although Krause considers this unnecessary.

The method of dressing has varied greatly with different operators. Kennedy in one instance left the first dressing of sterilized gauze in place five weeks, healing being complete on its removal. Wolfe, whose operations were on the face, usually changed the first dressing on the third day and then made daily dressings. Krause changes his first dressing in three or four days and dressed the wounds again every two or three days, soaking off the gauze with boracic acid solution immersing the entire member in the solution for about an hour. Of course the method must differ somewhat with the case. Cleanliness and fixation are the two desired conditions. If there is doubt about the former, the dressing would be changed oftener than if asepsis is assured. The nourishment of the graft takes place by effusion at first, and then minute vessels have been observed running into the graft itself, in some instances communicating with those vessels which already existed there. It is important that the grafts should not be moved, as these vessels are of course very delicate indeed. It is difficult to avoid moving the grafts in changing the dressing, and therefore great care must be used. In the cases here reported rubber tissue has been put over the graft and allowed to extend about a quarter of an inch beyond its margin on all sides. Moist gauze has been placed above this, which is also protected by rubber tissue to prevent its too rapid drying, and this has been enveloped in dry sterile gauze. The part has usually been put in plaster, and the first dressing has been done eight to fourteen days later. If there is a purulent discharge, it can quickly be told by the odor, a part of the gauze being left uncovered by the plaster for this purpose. The first rubber tissue is usually not changed at the first dressing; if changed it has been replaced by a similar one. One can easily appreciate the advantage of Krause's method, which consists in soaking

the entire member for an hour in boracic acid solution until the gauze is entirely loosened from the graft; but many of these contractures occur in children, and it would be practically impossible to follow this method with them without having the graft injured.

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FRACTURES OF THE METACARPAL BONES.

BY RAYMOND RUSS, M.D.,

OF SAN FRANCISCO, CALIFORNIA.

METACARPAL fractures are far more common than the older writers would lead us to believe. For instance, Maligne found but sixteen cases in a total of 2377 fractures, or .67 per cent. Hamilton bases his observations on but ten cases. The X-ray has added much to our existing knowledge of these fractures, and it is safe to assume that many cases which have previously been diagnosed as contusions and dislocations have belonged to this class.

But little attention has been given to these injuries, and the scanty literature upon the subject and the brief accounts to be found in our surgical treatises have led me to collect the cases which have come under my observation. The majority of metacarpal fractures present few difficulties. The fractured bone is well splinted by its fellows. Deformity is often slight and reduction fairly easy. A certain number of old cases have been observed in patients presenting themselves for other lesions, and the marked shortening which has followed, resulting in the loss of the knuckle, and the excessive callus which has formed have shown that existing methods of treatment are imperfect.

My own series embraces twenty-seven cases, the greater part of which have presented themselves at the Surgical Clinic of the University of California Dispensary. The fractures have occurred in patients ranging in age from fourteen to sixty-three. I have seen but one case of metacarpal fracture occurring in a woman. Friedrich reports having seen but one female patient in the entire material of his polyclinic. Of my cases, but one has occurred between the ages of ten and twenty years, eight between twenty and thirty years, ten between thirty and forty years, five between forty and fifty

years, two between fifty and sixty years, and one over sixty years. In but one case of the series was more than one metacarpal bone fractured. This was a fracture of both the fourth and fifth metacarpals of the right hand resulting from a fall.

The cases which have come under my observation have been particularly free from complications. None of the fractures were open. Fractures of the phalanges complicating fractures of the metacarpals have not been frequently met with. I have seen but two such cases, the first, a fracture of the first phalanx of the little finger complicating an oblique fracture of the middle of the shaft of that metacarpal and resulting from a fall from a height; the second, a fracture of the first phalanx of the fourth finger complicating a fracture of the fourth metacarpal. This patient had been held up by footpads, and, in endeavoring to defend himself, had received several blows with some heavy weapon across his clinched fist.

In my series I find that the first metacarpal has been fractured in 29 per cent., the second in 15 per cent., the third in 11 per cent., the fourth in 15 per cent., the fifth in 26 per cent., and the fourth and fifth together in 4 per cent. Fractures of the first and fifth bones then have been most frequently met with. This is contrary to the statement of Stimson, who says that the third and fourth are most frequently broken, the first and fifth least.

Nine of my fractures resulted from indirect violence, a blow delivered with the clinched fist, the force being received on the distal end of the bone and operating in the direction of its long axis. Hamilton states that five out of his ten fractures were produced in this way. A force thus applied will generally make an oblique fracture about the middle of the shaft. In one of my nine cases the first metacarpal was involved, the second was fractured in two, the third in two, the fourth in one, and the fifth in three. The fifth metacarpal is probably fractured in glancing blows upward. Another case

of indirect violence said that he had tripped and fallen, receiving the impact of the fall upon the tip of the thumb, held at the time in extension. This produced a fracture at the middle of the shaft. Lonsdale has recorded a case in which fracture of the third metacarpal was caused by a fall upon the end of the outstretched middle finger. The cases of direct violence have resulted from falls upon the back of the outstretched hand caused by slipping on the pavement, or falls from a height, as a wagon or street car. In two cases the injury was caused by blows delivered across the back of the hand, one being a fracture of the first, the other a fracture of the fourth metacarpal.

The first metacarpal bone may be broken at any place in its length. I have found the diagnosis of these fractures extremely difficult in some cases on account of the extensive effusion occurring into the flexor tendon sheath. Two of my cases are especially interesting, as they are good examples of the so-called Bennett's fracture or stave of the thumb (*British Medical Journal*, July, 1886). This is an oblique fracture at the base of the first metacarpal bone. Bennett obtained six museum specimens which showed this deformity. From these he was led to conclude that the fracture was a very common one, and he believed was often mistaken for partial luxation of the metacarpal bone of the thumb. The eighteen years, however, which have followed the publication of Bennett's article have proved his conclusions to be erroneous. The fracture is rare. I have found since Bennett's article but two cases reported in the literature, one by Roberts, of Philadelphia, reporting a case of Dr. G. T. Beatson, of Glasgow, Scotland (*Philadelphia Medical Journal*, March, 1901), the other by Prichard, referred to in von Bergmann's "Surgery."

The history of my first case is as follows:

J. B., a railroad engineer, aged forty-one years, while adjusting the headlight on his engine, slipped and fell. He remained unconscious twenty-five minutes. He resumed work soon after

the accident, but his left hand was very painful. Eight hours later, when he reached the city, his glove had to be cut off. The whole hand was much swollen. Careful palpation of the metacarpal and phalangeal bones revealed no fracture. The hand was treated as a simple contusion and hot applications made. One month later the patient again reported. The thumb was still very painful, especially when adduction was attempted. The patient had not been able to resume work since the receipt of the injury. The maximum tenderness was at the base of the first metacarpal bone. There was considerable fluid in the flexor tendon sheath. Outside of the thenar eminence there was little swelling. The bone was fractured in two places, obliquely just below the articulation and longitudinally running into the joint between the metacarpal bone and the trapezium. The thumb was put up in abduction, being held in this position by an internal rectangular card-board splint. One month later the joint was somewhat stiff, but the patient had been able to resume work.

The following is the history of the second case of Bennett's fracture which I have seen:

T. D., aged twenty-seven years, an oiler by occupation, took part in a street fight two days before he presented himself to me. He reported that he struck a heavy blow with his left fist tightly clinched, the force being received on the head of the first metacarpal. He went immediately to the City Receiving Hospital, where a diagnosis of backward dislocation of the first metacarpal was made and a pasteboard splint applied. On examination, I found great swelling over the thenar eminence. Posteriorly, there was a prominence at the base of the first metacarpal. The thumb appeared slightly shortened. Profiting by my first case, I succeeded in eliciting crepitus at the metacarpal base. The radiograph (Fig. 1) was then taken. It shows a displacement of the distal fragment upward. A slate-pencil coaptation traction splint, to be presently described, was then applied, and this reinforced by a rectangular card-board splint. Function was restored at the end of three weeks.

The displacement in this case was similar to that present in the one reported by Roberts. There was no displacement noted in my first case. The injury is probably caused by a blow upon the tip of the thumb, held at the time in extension, or upon the head of the metacarpal, the fist being clinched. The case cited by Bennett is instructive. A young man, while horseback riding, was thrown violently forward, the tip of the thumb being dashed against the pommel of the saddle.

Through the kindness of Dr. Harry M. Sherman, I have seen a case of spiral fracture of the fourth metacarpal occurring in a woman. This woman was an asylum nurse. The fracture resulted from the corresponding finger being twisted by an insane patient.

Fractures through the metacarpal heads are uncommon. The following case is of interest on account of its rarity and the facility with which reduction was maintained.

P. C., aged twenty-seven years, a longshoreman by occupation, while alighting from a street-car was thrown, violently striking upon the back of his right hand. When he presented himself at the clinic the next day, there was considerable swelling over the second metacarpal-phalangeal joint, the knuckle being greatly depressed. The first phalanx was found to be intact, but its base had sunk on to the dorsum of the hand, resembling a dislocation. On palpation, crepitus was determined at the head of the second metacarpal. There was considerable displacement of the fragment. Fractures at this point are held with the greatest difficulty, and, as the fracture ran into the joint, the patient was told that, notwithstanding what might be done, he would probably have a stiff finger. Reduction was accomplished by means of forcible traction, and the following dressing was then applied. Slate-pencils were placed as coaptation splints on each side of the broken metacarpal, two in the palm and two on the back of the hand. These extended from the metacarpal base to the middle of the shaft of the first phalanx. The slate-pencils were firmly secured in position by means of two narrow strips of adhesive plaster passed about the hand.



FIG. 1.—Bennett's fracture or stove of the thumb. (Case II.)



FIG. 2.—Dorsal view of coaptation and traction splint of slate-pencils applied to a fracture of the third metacarpal.



FIG. 3.—End result in operation on fifth metacarpal for malunion and painful callus.

Small rubber bands were then placed over the projecting ends of each pair of slate-pencils so that they would press quite deeply into the interosseous spaces. The dressing was then completed by making traction forcibly upon the finger, and maintaining this traction by means of an adhesive strip wrapped firmly about the finger and the projecting ends of the four slate-pencils. Cotton was then placed between the fingers and about the tips of the slate-pencils to prevent rubbing, and the dressing completed by a posterior splint of wood. (Fig. 2.)

On inspecting the hand three days later, I found that the dressing had held remarkably well, nor did the patient complain of it. Although it had been necessary to apply it quite tightly, there had been no interference with the circulation. The dressing was then removed. Seven days after the dressing was applied, the hand was again examined. I was surprised to find that the patient had complete range of motion of the index-finger, and that the affected knuckle was as prominent as the corresponding one on the uninjured side.

This splint has been used with excellent results for all fractures about the heads or distal portions of the shafts of the metacarpal bones. By its use accurate approximation has been obtained, and the callous, deformities and shortening, so common in these fractures, avoided. Traction, difficult to obtain on account of the laxity of the metacarpo-phalangeal joint, has been more satisfactory in this method than in the older modes of treatment which have been previously employed. Small lead-pencils may be used with equal facility. Some slate-pencils are too brittle to be of service. The dressing is applied with considerable difficulty to the second metacarpal, but is easily applied to the third and fourth. For the first and fifth metacarpals the dressing is modified by employing two pencils placed in the interosseous space and one pencil applied laterally. Dressings of the thumb should be reinforced by the internal rectangular splint. In all these dressings a posterior splint of wood or card-board is an additional safeguard.

The dressing recommended by Carl Beck (*New York Medical Journal*, August, 1900) has also been used with good results in cases where traction was not necessary. This consists of a co-

aptation splint made of short pieces of drainage-tube of moderate size applied on each side of the fractured bone on the dorsum of the hand and held in place by strips of adhesive plaster. The old dressing—a roller bandage placed in the palm of the hand, the fingers being drawn down firmly over it—has been employed in a number of cases in this series, but has not given uniformly good results. Traction in this method is very unsatisfactory. The pressure exerted is unequal, and posterior bowing of the fractured metacarpal has occurred. Fractures of the second and fifth metacarpals are very inadequately protected by this method, and no attempt is made to correct lateral deformity.

I have operated for malunion and painful callus in one case in this series. This was a man aged thirty years, a cabinet-maker and a musician. He had fractured his fifth metacarpal, right hand, while striking a punching-machine. He was attended by a physician at the time, but the lesion was unrecognized. When he applied to me one month later, there was a large amount of exuberant callus over the lesion; there was considerable shortening, and movements of the finger were very painful. He had been unable to follow his trade or pursue his musical studies since the accident. Under anæsthesia, an incision was made on the dorsal surface over the fifth metacarpal, the exuberant callus chiselled away, and the bone refractured. The operative wound was then closed and the finger placed on a wooden extension splint, the coaptation dressing of Beck being also employed. The patient had free use of his finger three weeks after the operation. The end result is shown in the radiograph (Fig. 3). There is slight lateral deformity and some thickening over the bone, but the knuckle is prominent. The range of motion is perfect.

The diagnosis of metacarpal fractures presents few difficulties. All the bones are easily palpable, and in fresh cases crepitus can generally be ascertained. For obtaining crepitus, the method recommended by Scudder is useful. "Grasp the finger corresponding to the fractured metacarpal with the whole right hand, steadying the injured metacarpal with the left hand, and make steady and continuous traction." This method serves admirably also for reduction. The fracture heals very rapidly, and for this reason early motion is advisable.



Bennett's Fracture. Case IV.

FRACTURE OF THE ASTRAGALUS WITH SUB- ASTRAGALOID FORWARD DISLOCATION OF THE FOOT. REMOVAL OF THE ENTIRE ASTRAGALUS.

BY C. O. THIENHAUS, M.D.,

OF MILWAUKEE, WIS.

MR. F., a Finlander, thirty-seven years old, from Ishpeming, Mich., a miner by occupation, seen in consultation with Dr. B., in Ishpeming, gave the following history :

Four months ago, while working in a mine, he fell backwards from a height, a number of rocks falling with him. He landed on his feet and after being extricated from the rocks it was found that his left ankle was swollen considerably and the foot dislocated forwards. An immediate attempt was made to reduce the dislocation under narcosis, but it proved unsuccessful, and as an insurance company paid for him while unable to work, he would not permit a bloody reduction immediately.

When I saw him four months later the following status presented itself: The ankle joint of his left leg was partially ankylosed. The left foot, on which he was unable to step, was standing in a decided varus position and seemed largely elongated. Taking measurement from the external malleolus to the os calcis, the distance was approximately 1 to $1\frac{1}{2}$ cm. on the injured foot, while on the healthy foot the same distance was 3 cm. The distance measured from the inner malleolus to the tip of the great toe was greater on the injured than on the healthy foot. I advised taking a Röntgen-ray picture from three directions, to clear up the diagnosis, and found the conditions as demonstrated in the accompanying plates.

Number 1 was taken in an antero-posterior direction and showed the fracture of the external malleolus. Nos. 2 and 3 were taken from the inner and outer side respectively and demonstrated that we had to deal with a fracture of the astragalus and subastragaloid forward dislocation of the foot. As four

months had elapsed since the date of the accident, I did not take the bloody reduction into consideration, but advised the removal of either a part or the entire astragalus, to overcome the deformity and to make the foot useful.

I used an incision extending from 6 cm. above the external malleolus down parallel to its posterior border to the tip of the external malleolus, from there in a curved direction to the middle of the foot on its dorsal side. As both peronei tendons were crossing the field of the incision and could not be retracted sufficiently to clear the field of operation, these were divided. Then the entire astragalus was removed with great difficulty, owing to the dense adhesions that had formed; the peronei tendons sutured and the wound partially closed and partially drained. A plaster-of-Paris cast was then applied with the foot standing in an overcorrected position.

Ten weeks after the operation he was able to walk about and four months later, when he did not receive any more money from the insurance company, the slight pain of which he still complained disappeared and he took up his difficult work as a miner again. A movable joint has formed between the external and internal malleolus and the os calcis.

The position in which the foot is standing now, is shown on Plate No. 4.

Epicrisis.—Subastragaloid dislocation of the foot is of rare occurrence and was first described by Nélaton in his "Surgical Pathology." The condition has been frequently mistaken for dislocation of the astragalus, and Broca was the first (1853) to show that subastragaloid dislocation must be strictly differentiated from dislocation of the astragalus. Deetz (Deutsche Zeitschr. f. Chirurgie, Vol. 74, p. 581) has recently collected all cases of subastragaloid dislocation of the foot, cited in the world's literature. To avoid unnecessary repetition I refer the reader to this article in regard to literature on this subject. Deetz found that subastragaloid dislocation to the inner side is most common; twenty-eight cases being reported. Twenty-five cases of subastragaloid dislocation to the outer side are reported in the literature; twelve cases of backward dislocation and only six cases of forward

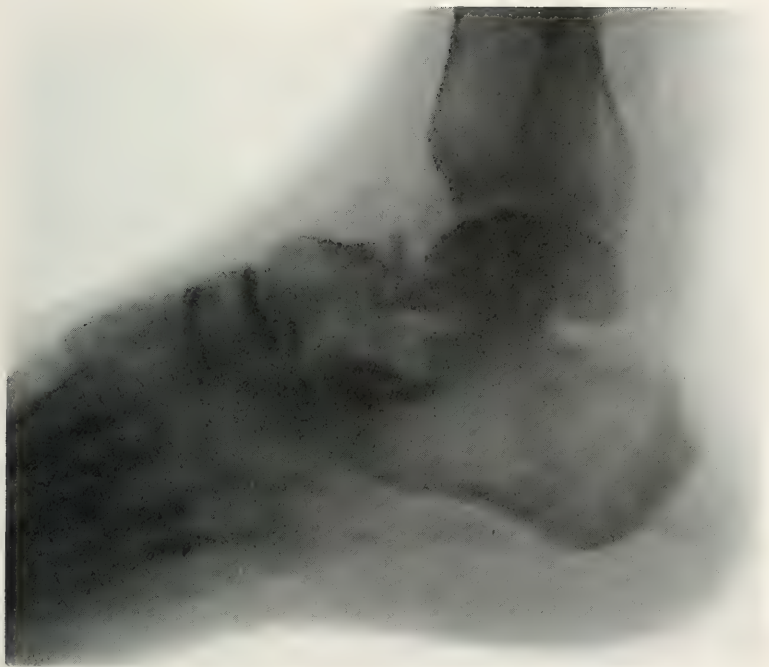


FIG. 1.—Fracture of Astragalus and Subastragaloid. Forward dislocation of the foot.
View from outer side. Op. 2, 3, 1904.



FIG. 2.—Fracture of Astragalus and Subastragaloid. Forward dislocation of foot.
Results after removal of Astragalus.

dislocation of the foot, to which he adds a case of his own. From these last seven cases, three,—*i. e.*, those reported by Parise, Petit and Planteau, were simple cases of subastragaloid dislocation without fracture of the astragalus, while the four others reported by Guenzerich, Sick, Mailland and Deetz, were complicated by a fracture of the astragalus. My case therefore would be the fifth case of subastragaloid forward dislocation of the foot with fracture of the astragalus, and is furthermore complicated by a fracture of the external malleolus.

That fractures of one or both malleoli are not so seldom complicated by partial or total fractures of the astragalus, has been proven since the enlightening of the dark field of fractures by the Röntgen ray.

In but one case of the seven cases of subastragaloid forward dislocation of the foot it was necessary, as in my case, to resect the entire astragalus because of the long standing of the deformity. This case (operated on by Kuester) is cited by Guenzerich, already mentioned above. The deformity existed, in this case, six months before the patient entered the hospital.

In regard to the cause of subastragaloid forward dislocation of the foot, the patient in nearly all cases gives the following similar anamnesis:

The patient seeing that he is falling from an exposed height such as a ladder or rock, jumps to save himself, backwards, or sideways and backwards, then lands with his heels on the ground, tumbling over backwards or forwards, with the foot standing in dorsal flexion. In my case it was difficult to get any definite history, since the patient spoke the Finnish language only.

Diagnosis.—The diagnosis is at times very difficult, due to the enormous swelling and intense pain in the ankle joint and surrounding parts. However, the lengthened dorsal aspect of the foot, so characteristic in all cases of subastragaloid forward dislocation, should always suggest the diagnosis, particularly if, as should be done, comparative measurements are made on the sound foot.

As the corpus of the astragalus is still in contact with the external and internal malleolus, some mobility in the ankle joint must naturally be present, providing the malleoli are not injured or fragments interposed at the same time.

In our days, with the Röntgen ray at our disposal, it is not only desirable but absolutely necessary for a scientific diagnosis and treatment to have a Röntgenogram of the fracture taken from several directions.

However as not every practitioner has easy access to a Röntgen-ray coil, the clinical symptoms of fractures ought by no means to be neglected in our teachings.

Treatment.—In recent cases of subastragaloid forward dislocation of the foot, reduction of the dislocation must be tried at once under anaesthesia, and can usually be accomplished by strong dorsal flexion of the foot. If this does not bring about the reduction on account of the interposition of fragments or muscular tissue or parts of the capsule, the bloody reduction without or with the removal of the interposing fragments will usually be followed by excellent results.

In cases of long standing, such as my case and the one cited by Guenzerich, nothing less than the entire removal of the astragalus is sufficient to overcome the mal-position of the foot, and, as the ultimate result in both cases has proven, may give excellent functional results, a new joint forming between the two malleoli and the os calcis.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, November 8, 1905.

The President, Dr. HOWARD LILIENHAL, in the Chair.

INTESTINAL OBSTRUCTION; FROM ADHERENT MECKEL'S DIVERTICULUM.

DR. CHARLES L. GIBSON presented a boy, four years old, who was admitted to St. Luke's Hospital on October 21, 1905, with a history dating back five days, when he was seized with sudden vomiting which soon became continuous. No cause for this could be assigned.

When Dr. Gibson saw the boy he was in a condition of collapse, with a temperature of 99 F., and a pulse of 136. The abdomen was much distended. It was opened in the median line, and an obstruction of the lower portion of the ileum was found. The collapsed segment of the gut led to a Meckel's diverticulum, and upon investigation it was found that the obstruction was not caused by the diverticulum itself, but by an adhesion extending from the mesentery to the diverticulum. This was divided, and although the involved section of the gut seemed to be in pretty bad condition, the circulation gradually returned, and the boy made an uneventful recovery. The Meckel's diverticulum was about the size of the last joint of an adult finger, and was situated eight inches from the ileo-cæcal valve.

In reply to a question, Dr. Gibson said he did not remove

the diverticulum, as it was not the direct cause of the obstruction, and as the child was apparently moribund at the time of the operation.

DR. CHARLES N. DOWD asked whether any of the members had ever seen a case where a constriction of the intestine had resulted from the obliteration of Meckel's diverticulum? He had recently operated upon a case in which a constriction existed there. Whether it was temporary or not could not be determined, but it persisted during the half hour that the operation lasted.

DR. ROBERT H. M. DAWBARN said he did not think the complication suggested by Dr. Dowd was ever likely to occur. The diverticulum nearly always sprang from a section of the gut (the ileum) the contents of which, according to Murphy, were invariably fluid. In the large intestine, the contents of which were comparatively solid, obstruction was much more apt to occur. When the Murphy button was first brought out, the objection was made to it that the small opening it left would be apt to become obstructed, while as yet the button had not become detached, and in answer to that criticism, Dr. Murphy published the results of a series of experiments and made the assertion that the contents of the small intestine were invariably fluid, and for that reason obstruction in that region of the bowel, need not be feared.

DR. LILIENTHAL said that a few months ago he was called to see a girl six years old who had just recovered from the whooping-cough, during the course of which she had had attacks of abdominal pain. When the speaker saw her, she had been very sick for two days. The bowels had moved after castor oil. There was some abdominal distention. The temperature was not particularly high, and the child's parents were very much averse to operation. She was, however, sent to the hospital, and immediately after her admission she went into a state of collapse.

Upon opening the abdomen, which was done without delay, Dr. Lilienthal said he came upon a Meckel's diverticulum about five inches long, and characteristic in appearance. It was turned under a fold of mesentery, and adherent somewhere in the right loin. The belly was full of bloody fluid, and the area of gangrene had extended up to the small intestine.

On account of the poor condition of the patient, nothing was

done but to draw the diverticulum into the wound, and make a quick entero-enterostomy with rubber ligature between the two legs of the involved loop. The patient died a few hours after the operation.

In this case, the speaker said, we had an organ much larger than the appendix completely gangrenous, and yet the symptoms were so mild until the child went into collapse that the advisability of an operation was doubtful.

CARCINOMA OF THE MALE BREAST.

DR. GIBSON presented a man, 67 years old, whose previous and family history was unimportant, with the exception of the fact that ever since he could remember he had a small lump in the left breast. Five years ago this had begun to increase in size, and a year later it began to ulcerate.

When the patient was admitted to the hospital, on October 2, of the present year, he presented a large, ulcerating mass firmly fixed to the chest wall. There was marked involvement of the axillary glands, and the outlook did not appear very hopeful. An operation was done, at which, in addition to separating the tumor from the chest wall, it became necessary to remove part of the intercostal muscles. The condition of the patient did not permit of immediate skin-grafting, and the wound was now healing by granulation.

Dr. Gibson said that this was the first case of carcinoma of the male breast upon which he had had occasion to operate. The case was also interesting because it illustrated the fact that benign tumors occasionally became malignant.

Pathological diagnosis: Alveolar carcinoma.

In reply to a question, Dr. Gibson said that he could offer no theory as to the origin of the cancer in this case. There was no history of irritation at the nipple: nothing but the tumor in the upper quadrant of the breast, and that had been there since childhood.

DR. LILIENTHAL said he had operated on one case of carcinoma of the male breast in which the patient distinctly traced the condition to the constant irritation of a suspender-buckle, which occasionally caused his nipple to bleed, and which might have had some etiological bearing. That patient was a man

about thirty years old. He always wore soft flannel shirts, and the buckle of his suspenders rested right over the nipple.

DR. ARTHUR L. FISK said that some years ago he saw a carpenter with carcinoma of the breast which was supposed to have been produced by the pressure of the stock of a bit against his left breast. The breast was excised.

DR. DOWD mentioned a case in an actor who for a long time had played a part in which it was necessary for him to repeatedly strike himself on the breast with his fist.

DR. LILIENTHAL called attention to the fact that these traumas may have only aggravated a pre-existing tumor.

DR. FRED KAMMERER said that he had operated on several cases of carcinoma of the male breast in which the disease proved to be of rather a malignant type.

EXCISION OF THE UPPER JAW.

DR. OTTO G. T. KILIANI presented a girl of twenty years, who developed a hard tumor of the right upper maxilla, which was first noticed about four years ago. The tumor gradually increased in size, and an operation for its removal was undertaken on October 16, 1905. Preliminary to the operation, the right external carotid artery was ligated, and the enlarged glands in the neck removed. He then made a resection according to Kocher, somewhat modified to prevent a disfiguring scar, and extirpated the entire upper right maxilla. There was no resulting facial paralysis, and the cosmetic effect was excellent, and would be further improved by the ultimate insertion of a proper plate. The pathologist reported that the tumor was a fibroma, and absolutely benign.

DR. ROBERT H. M. DAWBARN said in approving of the external carotid ligation performed in this case, the New York Surgical Society had not put itself definitely on record in regard to the advisability of ligation of this artery as a preliminary step to certain otherwise very bloody operations on the face, and that even an excision of the upper jaw was resorted to by some operators without such a preliminary measure. In so prominent a work as "Butlin upon the Surgery of Malignant Growths," that author nowhere advocates preliminary ligations, and seemingly retains as many surgeons still do the fear of secondary hemor-

rhage from the external carotid, if tied; a fear based upon the close order in which its branches are given off—leaving no place for formation of an internal clot. Dr. Dawbarn said he had ligated the external carotid over one hundred times in living subjects, without encountering any secondary hemorrhages at all. The subject had come up for discussion at the recent meeting of the Pennsylvania State Medical Association, at Scranton, and Dr. Crile, of Cleveland, had made the statement that in a few instances sudden death had followed the operation; he did not say, however, that the cause of death in those cases was secondary hemorrhage. Dr. Dawbarn said, that in his opinion, ligation of this artery is, in experienced hands, practically without mortality, and that these were cases in which the internal carotid was tied by mistake. He recalled such a case occurring at the New York City Hospital at his own hands, early in his experience, where the unintentional ligation of the internal carotid by himself in mistake for the external was followed within a few hours after the operation by coma and a rapidly developing lobar pneumonia, with death within two days. This latter strange complication, the speaker said, he had subsequently learned was mentioned by Erichsen in his work upon surgery as an occasional ill-explained result of tying the internal carotid. The only way in which this error could be avoided was to find, before tying, a perfectly frank bifurcation of the common carotid; *i.e.*, one giving off branches in the neck, the other not doing so. In the fatal case for which he had been responsible, Dr. Dawbarn said, an inequality of the pupils was noticed shortly after the operation; and if recognizing promptly the significance of this striking fact, the wound had been immediately re-opened, and the ligature removed, which had been tied of course but gently about the internal carotid, the circulation in the brain might have been restored, and the patient's life probably have been saved.

It seemed to the speaker well worth noting that the commonest anomaly in man, is the rule in dogs: namely, that there is no external carotid, but, instead, the internal on its way to the brain gives off all the branches usually arising from the external carotid. In such a case it is plain that although control of the seeming external carotid would stop the pulse over the facial and superficial temporal arteries, this, the usual test given in the

text-books, would be valueless, might well cost the patient his life, and as a further blunder might easily be recorded by the operator as a death in consequence of ligation of the external carotid.

DR. KAMMERER said the mistake of tying the internal instead of the external carotid, to which Dr. Dawbarn had referred, could be avoided, and therefore did not count against the operation. The speaker said he had resorted to preliminary ligation of the external carotid in a number of operations on the upper jaws. In one instance, a temporary resection of both superior maxillæ (Kocher), he had tied both external carotids with excellent result.

DR. LILIENTHAL called attention to the advisability of the surgeon calling in a dentist before operating on a case of this kind. If the dentist was given the opportunity of looking over the ground beforehand, he knew about what he had to do and could get his mechanical appliance pretty well under way, whereas if we waited too long, the fitting of a prosthetic apparatus might be attended with difficulty. The speaker said he had seen cases where the deformity left after removal of both upper maxillæ was absolutely uncorrectable.

DR. KILIANI in closing, said that his patient had for a time after the operation complained of a severe unilateral headache on the side where the external carotid was ligated. It had eventually disappeared entirely. In reply to Dr. Lilienthal's suggestion, Dr. Kiliani said that a dentist had been called in to see the patient before the operation, but he had offered no suggestions, and said he would do nothing until the jaw had been removed.

THE VALUE OF WOLFE GRAFTS AND TENDON-LENGTHENING IN THE TREATMENT OF CICATRICIAL CONTRACTURES.

DR. CHARLES N. DOWD presented a paper with the above title (for which see page 278).

IN connection with his paper, Dr. Dowd presented two patients upon whom he had operated by the method described. The history of these cases was contained in his paper.

DR. DAWBARN said he wished to emphasize the following points in reference to tendon-work only: In splicing ten-

dons, he thought it advisable to remove as much of the sheath as possible. Excepting right at the fold of the finger, where a short portion must be left, the sheath elsewhere was the enemy of the surgeon, and with its free removal there was less plastic exudate to deal with—less gluing fast by teno-synovitis. The use of Johnson & Johnson non-adhesive gold-beater's skin court-plaster to prevent adhesions between the tendons—as first recommended by Dr. Robert Morris. The speaker mentioned two personal cases in which there was sloughing of one of the tendons of the finger not far from its insertion (in one of them for a distance of nearly two inches), and in order to get a satisfactory result he had cut into the wrist high up, near the muscular juncture, and then, after finding the right tendon, it was severed extremely obliquely, so as to make a very long splice, and seizing its end in the other wound (that in the finger) it was drawn down until it came in contact with its opponent on the opposite side (*i. e.*, toward the finger-end) to which it was united by suturing. So far as the speaker was aware this plan has not elsewhere been employed.

Dr. Dawbarn said that in two cases of tendon-grafting, he had used tendons obtained from the leg of a cat. One proved successful; the other was a complete failure; the graft, about an inch long in both instances, having sloughed, in this second trial. However, as tendon is nourished only by vitalized plasma, and not directly by vessels of its own, such heteroplastic grafts deserve a better trial than they have heretofore received.

Dr. LILIENTHAL said that in his own experience with these cases he had found that the success of the operation depended largely upon the complete excision of all the cicatricial tissue, followed by the application of Thiersch grafts of considerable thickness, but not through the full thickness of the skin. He recalled two cases, one of cicatricial contracture of the axilla and the other of the elbow, following burns, in both of which the parts were firmly bound down. In each case he excised the scar completely, until the motions of the limb were perfectly free, and then, after applying grafts by the ordinary Thiersch method, the arm was put up in the extended position, and in both instances he obtained a perfect result. The Thiersch grafts employed for

this purpose should not be of the very thinnest kind, nor should they include the full thickness of the skin, as the Wolfe graft did. The removal of the cicatricial tissue should be by thorough excision; simply denuding the surface or scraping away the granulations would not be satisfactory.

DR. KILIANI said that in the case of the child with the contracture of the elbow shown by Dr. Dowd he would be interested to learn how the Thiersch grafts behaved after two years had elapsed. Fifteen years ago, in the case of a severe burn on the inner surface of the arm, he had applied skin-grafts by the Thiersch method, and within four months the grafts had shriveled up to such a degree that they were removed without difficulty, while at the same time the sound skin had stretched to such an extent that its edges could be brought together. The speaker called attention to the fact that the skin-grafts contained no elastic fibres, and on that account shrinkage occurred.

DR. DOWD, in closing, said he had seen very annoying shrinkage occur in Thiersch skin-grafts, and for that reason thought it better to employ grafts of greater thickness. Kennedy's case, above referred to, is an important illustration of the relative value of the two varieties of grafts. He had employed the Thiersch and the Wolfe grafts side by side, marked contracture occurred in the former, but not in the latter. He believed that in the majority of cases of cicatricial contractures about joints the Wolfe grafts were much better than the Thiersch.

THE VITALITY OF RUBBER; WITH A NEW DEVICE REGARDING ITS LONGEVITY.

DR. DAWBARN said that he had investigated this subject, which was of some moment to the surgeon, and he had been informed by dealers that one of the best methods of preserving rubber articles was to keep them immersed in water. Of course, grease of any sort is fatal to rubber, as every one knows. Exposure to air, and quiescence, too, resulted in commencing crystallization, which was the beginning of the death of rubber. Many years ago, Dr. Gerster had informed him that in order to prolong the life of his rubber tourniquet, whenever he opened the closet where it was kept he took occasion to give it a good stretching. All bicycle-repair men advise, too, that a rubber tire should be

kept pumped up as hard as possible during the winter months of the bicycle's disuse; and that persistent deflation soon results in a rotten tire.

Obviously, maintenance of a persistent slight pull, to keep a rubber tube "awake," is better than semi-occasional stretchings at irregular intervals. And the object of these remarks was to show to the Society a pair of clamps, obtained from Ermold & Co., in this city, by which without cutting into the rubber the two ends of the large tubing we use for cording limbs are seized. One of these clamps is caught over a nail high in the closet; the other at the lower end, has a light weight attached to it. Thus the tubing is always subject to some little degree of tension.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting held November 6, 1905

The President, HENRY R. WHARTON, M.D., in the Chair.

SARCOMA OF THE BREAST IN A GIRL OF ELEVEN YEARS.

DR. WILLIAM L. RODMAN presented a girl of eleven years upon whom he had operated for sarcoma of the breast. Through an unaccountable oversight the specimen was thrown away by the clinic attendants and hence a microscopic examination could not be made, but from the clinical history and the microscopic appearance of the specimen there seemed no doubt that it was a sarcoma. Certainly it was a neoplasm and was not encapsuled. Nearly a year ago the patient struck the breast, the injury being followed by pain. She was treated in the dispensary of the Jewish Hospital from Easter until September, the pain persisting and the growth increasing in size. When Dr. Rodman saw the patient, the growth was evident and was reasonably hard. Immediate removal was advised because the pain was increasing and also because of the large veins which ran across the tumor; he has never seen such veins in anything but a sarcoma. Three weeks ago the entire breast, including a large area of skin, was removed; the incision was carried well into the axilla but no enlarged glands were found. Sarcoma of the breast at any age is rare, there being ten or more carcinomas to one sarcoma. Dr. Rodman has not seen another case in so young a girl but recalls the reporting by Dr. Dugan, of Louisville, of a sarcoma in a girl of eight, and still younger have been observed; he had never before seen a neoplasm of any kind in so young a child.

LAMINECTOMY FOR PARAPLEGIA THE RESULT OF TUBERCULOUS DISEASE OF THE SPINE.

DR. RICHARD H. HARTE presented a man aged twenty-six, who was admitted to the Orthopædic Hospital on September 5, 1904. There was no tuberculous family history obtainable. He had suffered from pneumonia two years previous, had scarlet fever when five years old and diphtheria when seven. 1896, when nineteen years old, he had typhoid fever which was complicated by phlebitis in both lower extremities, the right leg being the first affected. After three months of convalescence the leg ceased to swell. In 1898 he entered the army and in the course of his duties he fell and struck his left kneecap. The injury was not severe but there was much swelling and considerable pain. On June 29, 1898, he was admitted to the Pennsylvania Hospital under the care of the late Professor Ashhurst, with a diagnosis of tubercular disease of the left knee joint. Some iodoform emulsion was injected into the joint and a month later an abscess, apparently tuberculous in character, formed on the inner side of the right arm; this was opened and drained. Three months after his admission to the Pennsylvania Hospital the patient's knee condition improved and he left the institution walking on crutches. In the following May he returned to the hospital for examination and was under Dr. Harte's care. His limb was in good condition and he had a fairly useful knee and was allowed the use of his leg. After this date he states the abscess in his arm opened again and the shoulder became stiff. Two years later he was readmitted to the Pennsylvania Hospital and the knee joint was found to be so badly diseased that palliative treatment was no longer considered, and the limb was amputated by Dr. Hopkins in the lower third of the thigh, on October 23, 1901. The patient made a good recovery from the operation and returned to his home. Shortly after this he noticed a lump the size of a hickory nut on the lower dorsal region of the spine. He complained of pain in the lumbar region and was treated for lumbago. He was not seriously incommoded until June, 1904, when he began to suffer from what he described as "remittent fever." He was confined to bed for two weeks, and when able to be up noticed a numbness which he had felt for some months about his hips and which

increased so that his foot was numb; in a short time he entirely lost the use of his body and limbs below the waist line.

He was admitted to the Orthopædic Hospital in September, 1904, paralyzed from the waist down. Sensation was markedly impaired throughout the affected area. He had incontinence of urine and feces and a very severe grade of cystitis. The stump of the amputated limb was in good condition. There was very marked kyphosis in the lower dorsal region. Every effort was made to relieve the annoyance due to the incontinence; extension was applied to head and right leg and the bladder thoroughly irrigated twice daily. After about two months of treatment the sensation improved and the incontinence and cystitis disappeared. At this time he was able, with effort, to slightly move the great toe. He remained in this state for about five months and no further improvement seemed probable; the question of laminectomy was then considered. He was examined by some of the neurological staff of the hospital, who advised against operation. Nevertheless, on April 27, 1905, nearly eight months after his admission to the Orthopædic Hospital, with his desire, laminectomy was undertaken, although a cure was not looked for. The spines and laminae of the ninth, tenth and eleventh dorsal vertebræ were removed, thus thoroughly exposing the cord so that it could be approached from all sides. Considerable extradural tuberculous material was removed and the anterior portion of the neural canal curetted and made as smooth as possible. Practically no shock attended the operation and on recovery from the anesthetic the patient expressed himself as being able to feel the bed beneath him in a much more natural way than before operation. He was put to bed with extension and counter-extension to the head and extremity. The wound convalescence was uninterrupted. Gradually increased power in the great toe was developed and at the end of four weeks sensation was perfect all over the lower extremities. The toes could be flexed, the ankle-joint, right knee and amputated left thigh could be moved at will, although markedly ataxic. On July 1, three months after operation, a plaster cast was applied. This was worn until about September 21, when it was replaced by a brace. Since that time his ability to walk has steadily increased, until now, seven months after operation, he is able to walk as well as the average one-

limbed person, although he is necessarily handicapped in the use of his crutches by the brace. The first of October he developed a small abscess in the right shoulder, which was evacuated and soon healed.

In this case it would seem that ample time had been allotted to treatment by rest, extension, etc., and that if this mode of treatment was to be pursued further valuable time would be lost and degenerative changes would soon be manifested in the cord, which would materially interfere with the results from any operative measure which might be determined on at a later period. Operative treatment in this class of cases is much more applicable in adults than in children. In the latter most brilliant results can be obtained by extension, pressure, etc., as the age, anatomical conditions, etc., lend themselves more readily to this mode of treatment. In adult cases it is Dr. Harte's judgment that after a reasonable period of rest and extension in bed, if no positive results manifest themselves after, say, from four to six months, more positive and radical measures should be considered. He was inclined to think that the paralysis and symptoms occurring in this class of cases are due in a great measure to tuberculous and inflammatory deposits, thickening of the membrane in and about the canal, and that their removal by a laminectomy will give a thorough exposure of the cord and its membranes, both anteriorly and posteriorly, and will thus offer the best means of relief. This procedure should be carried, if necessary, even to the severance of some of the spinal nerves so that the operator can be positive that no point of pressure has been overlooked. In a very small percentage of cases will any bony or angular compression of the cord be found. The region of the spine most prone to these affections would naturally be the dorsal, where the lumen of the canal is more restricted and where a small degree of thickening will be followed by pressure symptoms. It is a well-known clinical fact that many severe grades of paraplegia may recover though great angularity still exists, provided the tuberculous and inflammatory deposits are absorbed.

A number of years ago the brilliant results reported by McEwen, Horsley, and others led the profession to believe that almost every case of spinal carious paraplegia would be cured by operation. As a result many cases were operated upon with

disastrous results. The operators failing to recognize that in addition to the local condition, their patients were afflicted with a weakening constitutional disease when the reactive condition was very low and where operative conditions were contraindicated.

With regard to the operative technique Dr. Harte had found that the best incision is one directly down on the top of the spinous process quickly separating the muscles and thoroughly exposing that portion of the column. For a few minutes violent hemorrhage will result, but this is easily controlled by pressure. After a thorough exposure of the laminæ by removal of the spines with a large bone forceps a trephine can be applied and the neural canal thus carefully opened. After the exposure of the cord the other parts of the canal can be easily removed with a pair of Rongeur forceps. The trephine seems to be the simplest means of entering the neural canal, and after the removal of the disc the later steps of the operation are comparatively easy, little difficulty being experienced in exploring and examining the cord. In closing the wound deep buried stitches of chromicized catgut should be employed, insuring accurate approximation of all the overlying tissues, thus doing away with any possible dead spaces for clots to collect in and favor suppuration. The wound is preferably drained with gauze, as its contact with the cord is not liable to cause any undue pressure, which might possibly arise from the use of a drainage tube.

DR. DEFORD WILLARD said the exceedingly favorable result obtained in this case by Dr. Harte was undoubtedly due to the thoroughness of the operation, which extended both above and below the principal lesion, and also to the fact that he was able to remove so much tuberculous deposit. If in these cases extensive pachymeningitis be present in addition to the deposit, operative benefits will not be so speedy or so satisfactory. Striking cases like the one shown by Dr. Harte were reported fifteen years ago by Macewen, Horsley and others and as a result the profession was deluded into thinking that all would give the same improvement. Laminectomy is an excellent operation in favorable cases; in others it is a total failure and relapses are numerous. In the case shown by Dr. Harte relapse is not likely to occur unless the man again becomes tuberculous. Dr. Harte spoke of the care needed in selecting cases and of the feebleness of

certain patients contraindicating operation. A very good illustration of these statements is the case of a boy upon whom Dr. Willard operated recently who for twenty months had lain totally paralyzed from spinal caries. At last motion slowly returned in his legs but as the muscles had contracted so much that he could not bend his ankles, it was decided to divide the tendo-Achillis in order to allow more motion. This was done, the boy, roused from his ether, talked and seemed comfortable, then suddenly died in five minutes in spite of every effort made in his behalf. The result showed the poor general condition of the patient, death following so trivial an operation as division of tendons, with the loss of about three drops of blood and with an etherization of only a few minutes in a patient with no discoverable renal or cardiac disease. These are cases that die after laminectomy.

DR. JAMES K. YOUNG said that Dr. Harte had very carefully selected his case in this instance, and hence had met with success.

The difficulty in selecting cases lies in the recognition of the pathological process which is present in an individual case. Only 2 per cent. of paraplegias are due to bone pressure and 25 per cent. to tuberculous masses, the majority being caused by pachymeningitis. These patients should be operated on early, and they are in England, but not early enough here, especially by orthopedic surgeons. The operation is often delayed until complete loss of sensation has existed for a long period, and until every other known means of treatment has been exhausted. Often they are allowed to continue without operation more than four or six months. Early spasticity and early contractures are indications for early laminectomy, no other symptoms being so urgent. In all cases where it is possible the anterior portion of the spinal canal should be carefully examined. The removal of tuberculous masses from the anterior portion of the cord is difficult and it is only in adults that it can be accomplished. The incision employed by Dr. Harte is the best of the various ones in use.

TWENTY-ONE GUNSHOT PERFORATIONS OF THE SMALL INTESTINES WITH RECOVERY.

DR. WILLIAM L. RODMAN reported this case, showing a specimen of six inches of jejunum containing three large perforations which was resected.

THE TREATMENT OF PERFORATIVE PERITONITIS.

DR. ROBERT G. LECONTE read a paper with the above title (for which see page 231).

DR. JOHN H. GIBBON said that the method described in Dr. LeConte's paper was a direct opposite of that advocated by many surgeons, in which the entire peritoneal cavity is thoroughly flushed and all of the lymph removed from the intestines. It is thought that many cases are lost because surgeons do not adhere strictly to either of these methods, that, is either a half-hearted irrigation is done, or else in trying to follow the Murphy plan too much is done. Murphy not only places these patients in the Fowler position after operation but has them brought to the hospital and placed upon the operating table in this same position. Dr. Gibbon stated that he had failed to introduce the large quantities of salt solution which Murphy recommended. He has employed the method in other respects in five or six cases with most satisfactory results. He lost one case treated in this way a few days ago but believes that the patient died from a pulmonary embolus. Since reading Murphy's first paper two years ago Dr. Gibbon has used much larger quantities of salt solution but states that after every abdominal section which he has ever done he has used either plain water or salt solution in the bowel. He learned this from Baer, who advocated it strongly fifteen years ago. Dr. Gibbon strongly urged the employment of the Ochsner treatment *after* the removal of the appendix; he believes that frequently cases die from a spreading peritonitis the result of an active peristalsis. He always gives his abdominal cases morphia before they come out of ether; this he also learned from Baer, and has employed it in every case. The patients are much quieter during their recovery from the anesthetic and are much more comfortable. Many of the cases require but the one dose of morphia. If, however, the patients are restless, and if peristalsis is to be avoided the morphia is repeated.

Dr. Gibbon is now watching four cases of diffuse peritonitis treated after the plan of Murphy, with the exception that the enemata of salt solution were not so large, and in which not a single suture was introduced in the wound. Incision was made through the right rectus. Three of these patients are entirely well and show no evidence of a hernia. Where no sutures are

introduced it is believed that the rectus incision is a much safer one than those which are more nearly over the appendix region. Another exception to the Murphy technique which Dr. Gibbon made in all of his cases is that of gauze drainage instead of tube drainage. He is careful to carry a large gauze drain back of the bladder, another to the right iliac fossa and a third into the right kidney pouch.

DR. RICHARD H. HARTE said that there were two classes of cases with which the surgeon is constantly coming in contact: First, where the infection is diffuse and very acute and which when opened and drained invariably do well; second, those in which a similar condition has remained from twenty-four to forty-eight hours, during which time the toxic influences have been increasing enormously until the patient is profoundly poisoned, and his powers of resistance materially impaired. In the latter class when operated upon the prognosis is always exceedingly grave it being impossible to say just what amount of toxine these patients can stand. It is here that most of the failures are to be found. There is no doubting the fact that the method of Murphy, as emphasized by Dr. Le Conte, of keeping the bowel full of water, is an exceedingly good one, and its employment often decides between failure and success in the treatment of these cases. For many years Dr. Harte has pursued practically this method of treatment and has long appreciated the good results which come from it. He also is thoroughly convinced of the importance of keeping food away from patients after operation, as the too early ingestion of food is bound to be followed by fermentation, distention, etc., thus adding materially to the discomfort of the patient.

DR. LE CONTE, in closing, said in reply to Dr. W. Joseph Hearn, who asked him to report the results of the Murphy treatment in cases of peritonitis of several days' duration, that persons are usually dead that length of time after perforation and he does not see them. If they do live for days, adhesions are generally found enclosing pus in pockets and these adhesions need to be broken up. Where pus is free in the peritoneum the method of Murphy gives only the best possible chance of recovery. The operation lasts but a few minutes, the amount of fluid in the blood vessels is increased, which stimulates the heart, and above all, by

its introduction into the rectum, the fluid changes the current of the lymph stream and prevents absorption of septic products. If the patient be in the typhoid state, as was one of those reported by Dr. LeConte, he believes much obnoxious material is passed out by the increased flow of urine from the kidneys. Usually only 12 to 15 ounces of urine are passed the first day after an abdominal operation, while in the case mentioned, 65 ounces were voided. This cannot be other than a great aid in eliminating toxic products. In answer to a question by Dr. Taylor regarding the length of nozzle for introducing salt solution into the rectum, Dr. LeConte said that two inches entrance was sufficient.

CANCER OF THE BREAST: CANCER OF THE CECUM.

DR. WILLIAM L. RODMAN exhibited these specimens. The first is interesting from a pathological and anatomical standpoint, as proving that the pectoral muscles should always be removed when operating for cancer of the breast. He has followed the teaching of Grossman and Ratler as regards the presence of glands between the two muscles, but had never before seen a clear demonstration of the truth of such statements. In the specimen are three enlarged glands between the two muscles, and none of them was seen or felt until the greater pectoral was removed. The glands all lay well below the upper edge of the pectoralis minor.

The specimen of cancer of the cecum was removed post-mortem from a man who had several months ago suffered from chronic intestinal obstruction. He was in a very bad condition when put upon the table, vomiting fecal matter and with a pulse beyond 130. The diagnosis of malignancy had been made some time before and it was quite clear that the only thing which could be done was an entero-anastomosis. When the abdomen was opened the diagnosis of carcinoma was evident, the growth appearing to have originated around the base of the appendix. Nodules of various sizes from a millet-seed to an olive were scattered over the intestines and mesentery. The small intestine was so greatly dilated as to look like the stomach; the cecum was collapsed. A lateral anastomosis between the ileum and the cecum was performed by the clamp method as employed by Moynihan in

gastro-enterostomy. The relief from obstruction was complete, patient living three or four months entirely comfortable so far as the intestinal current was concerned, an opening three inches long was made between the small and large intestines. There were no further symptoms of obstruction at any time during the life of the patient.

DR. ADDINELL HEWSON referred to a case operated upon last June in which he found between the pectoralis major and minor a single tumor the size of a duck egg. It extended from the pectoralis minor backward to the vessels. Both pectorals were removed. Subsequent microscopic examination showed the tumor to be a cancer. Concerning the anatomical relations of the part there are two chains of lymphatics, one to the breast proper, the other to the pectoral muscles themselves. These two chains join before emptying into the general axillary chain of glands and the growth described was situated at the junction of the two chains. Dr. Hewson has never seen glands situated so high as are those shown by Dr. Rodman. In his own specimen the growth was directly in the middle of the pectoralis minor. Pressure may have prevented it going higher, the mass from the outside appearing as large as a fist.

As emphasizing the great distention which occurs in the gut in cases of cancer, Dr. Hewson mentioned a case which came to the Oncologic Hospital after having been operated on elsewhere. Through the operation wound in the left groin a soft rubber catheter could be passed to a point between the median line and the opposite groin.

CHEWING GUM REMOVED FROM THE BLADDER.

DR. E. H. SITER showed this specimen, which had been in the bladder four days. It was remarkable chiefly for the large amount of salts adherent to it. The gum had been inserted in the penis to prevent nocturnal emissions.

DR. WILLIAM J. TAYLOR recalled the fact that he reported to the Academy last year an instance of gum in the bladder, it having been inserted in the penis to stop a gonorrheal discharge. This had become encrusted with salts and formed a large stone. Perineal section failed to allow removal of the mass, which was finally secured through a suprapubic opening.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting January 2, 1906.

JOHN B. ROBERTS, M.D., in the Chair.

CARCINOMA OF TONGUE.

DR. W. JOSEPH HEARN, at the request of Dr. W. W. Keen for whom he had operated, presented a deaf and dumb Russian girl who nine months previous to the operation noticed on her tongue a nodule the size of a cherry. She was for some months put on antisyphilitic treatment being in two hospitals, although no history of syphilis could be obtained. Under Dr. Keen's care a section of the growth, which had become much larger, was removed and microscopic examination showed it to be an epithelioma. The entire tongue was removed by the Regnoli-Billroth method, the incision extending from one angle of the jaw to the other and then down on either side to clear the neck of its glands. Both lingual arteries were tied. The tongue was held forward by the customary ligature in the anterior portion and in addition two ligatures were inserted near the base to afford better control of that part of the organ. The tongue was divided at its junction with the epiglottis. This left a very short stump which at once fell back, raising a difficulty as to its disposal. It was finally sewed to the remnants of the muscles of the mouth which were barely one-half inch long, the muscles being then included in a subcutaneous stitch under the jaw. The patient

has done very well since the operation, gaining 23 pounds during the seven weeks. The pathologist's report on the removed tongue was again epithelioma.

DR. JOHN H. GIBBON said this patient was under his care for some weeks at the Pennsylvania hospital. Dr. Stewart first saw her and was in doubt as to the nature of the growth on the tongue, that is whether it was syphilitic or malignant. Finally he thought she was not taking the prescribed treatment regularly and sent her to the hospital. There several surgeons saw her and among them there was difference of opinion regarding the nature of the growth. It involved the side of the tongue and the floor of the mouth, the edges being prominent and everted, and was covered by a nasty, greenish-colored slough. A small section of the growth was sent to the laboratory but the specimen was not satisfactory. The patient was put upon mixed treatment—potassium iodide in enormous doses and mercurial inunction. At first there was marked improvement, the growth diminishing in size and the slough separating. The patient was very tolerant of the treatment, there being no evidence of mercurialization except incontinence of saliva and this condition she had, as do all persons with tumor of the mouth, before treatment was begun. The result of the mixed treatment convinced him that the growth was syphilitic and later Dr. Stewart reported that he had obtained a clear history of syphilitic infection. Improvement, however, soon was less marked and the patient finally became disgusted with her progress and left the hospital. The case is of peculiar interest to Dr. Gibbon. He doubts that antisymphilitic treatment would have cured the patient, the case being one of those occasional instances in which operation is necessary. In view of the impunity with which mixed treatment was given and of the undoubted history of syphilitic infection, he is inclined to doubt the character of the growth as announced later. In addition and of great value clinically is the fact that when improvement under treatment occurred and the patient was able to open the mouth ulceration of both anterior pillars of the puces could be seen. These ulcerations healed under the anti-symphilitic treatment.

DR. JAMES P. HUTCHINSON said he saw the patient with Dr. Gibbon but did not agree in the diagnosis, as he believed the growth to be malignant in character. He was not, however, sufficiently confident of its nature to urge operation and with the other surgeons agreed that mixed treatment should be given. His opinion regarding the malignancy of the growth was considerably shaken by the improvement under three weeks' medical treatment and also by the absence of indications of mercurialization except the salivation which was present before treatment was begun. He did not see the patient again although he heard of Dr. Stewart's statement of an undoubted history of syphilitic infection.

DR. HEARN, in closing, said it was well known how rarely cancer is engrafted on a syphilitic lesion but if there is one place in the body in which this does occur it is the tongue. He now has under his care a gentleman from whom he had to remove part of the tongue which was cancerous and he believes the lesion originally was due to syphilis. All the glands of the neck in the patient exhibited were enlarged, though the lesion may have been syphilitic. In answer to questions by Dr. Gibbon, Dr. Hearn said he thought there was yet some granulation tissue in the floor of the mouth; the patient has had no constitutional treatment since operation.

DR. RICHARD H. HARTE delivered the annual address for 1906, his theme being: "The Life and Labors of Dr. Philip Syng Physick."

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ORIGINAL MEMOIRS.

FRONTAL AND ETHMOID SINUS EMPYEMA.

REPORT OF A CASE CURED BY OPERATION.

BY HENRY PERKINS MOSELEY, M.D.,

OF NEW YORK,

Assistant Surgeon to the Manhattan Eye, Ear and Throat Hospital
(Throat Department).

IN view of the large amount of work which has been done in the past few years on the accessory sinuses of the nose, I have thought that it might be of interest to report a case of Empyema of the frontal and ethmoid sinuses which offered unusual features before a cure was accomplished. These cases are not very common, although the diagnosis and treatment of them has been more satisfactory in recent years, and all additional light that we can get on them will be of considerable help. In this case operative procedures had to be repeated several times, but in spite of this the resulting deformity which is shown in the accompanying photographs, is not so great as might have been expected. Whether more radical measures should have been attempted at the very beginning is a question. I am inclined to think that if this had been done at the outset much of the subsequent trouble might have been avoided.

It is of course much easier, in looking back, to realize what should have been done, and the indications in these cases are sometimes misleading, for the patients often recover from an acute inflammatory process without needing an operation; but when they have gone on to abscess formation, and the nitra-nasal drainage is insufficient, I think the treatment should be radical and thorough, removing as much of the diseased tissue as possible.

The patient, C. W. F., 63 years of age; married; German; janitor, was referred to me by Dr. F. Tilden Brown. He was first seen on April 23, 1905, and from his physician and his son the following history was obtained:

In January, 1905, he had an attack of influenza with marked supraorbital pain, which was followed by the formation of an abscess at the upper inner angle of the left orbit. This was opened at one of the smaller special hospitals in New York city on February 12 under cocaine anæsthesia, the patient remaining in the hospital three days; but as the discharge continued, he later had an extensive operation at one of the larger hospitals on March 16, on the left frontal sinus and left ethmoid. This operation is said to have been a "Killian." The wound was left open. He had erysipelas and was transferred to the isolation ward, returning to his home April 15. The wound gradually closed, and the patient did fairly well except that a purulent discharge continued from a silver tube which had been placed in the inner angle of the wound. On April 21, the tissues in the neighborhood began to swell and there was considerable pain associated with the swelling. On April 22, an incision was made over the outer part of the eyebrow, allowing the escape of considerable pus. He was at that time told of the necessity of a more extensive operation and was referred to Dr. Brown through whose kindness I then saw him, on April 23, 1905.

Examination showed a man in good general condition except for a marked general arterio-sclerosis with irregular pulse and irregular heart action. His temperature was normal. The local examination revealed the left eye closed with a marked cellulitis and infiltration of the tissues all about it, running well up onto the forehead. At the outer end of the old "Killian" scar, which

extended outward perhaps two-thirds the length of the supra-orbital ridge there was a short incision $\frac{3}{8}$ of an inch in length from which pus was oozing. Just below the inner canthus was a silver tube which ran straight backward and inward $\frac{1}{2}$ inch; pus also discharged freely from this. When the eyelids were separated, the conjunctiva was suffused and boggy. Rhinoscopic examination revealed the presence of pus and crusts on the site of the left middle turbinated, which had evidently been removed. There was a small drop of pus at the site of the anterior and of the right middle turbinated, which was also missing. This was the only time that I detected any pus in the right nostril.

April 23, under nitrous oxide and ether anæsthesia, after inserting a post-nasal tampon, an incision was made from the outer discharging cut through the old scar down onto the nasal process of the superior maxillary. The tissues were all very œdematous. At the inner angle of the wound a probe detected loose bare bone and this was grasped with forceps and removed. Viewed in the light of subsequent events, this was probably the remains of the supraorbital arch and the floor of the sinus which had been left at the previous operation. It was irregular in shape, about $1\frac{1}{4}$ inches long and $\frac{1}{2}$ inch in its broadest diameter. When this was removed the cavity of the left frontal sinus was exposed, enabling the landmarks to be made out. This cavity was full of spongy purulent necrotic mucous membrane. This was all thoroughly removed with the curette; all dead bone was removed and the edges of the sinus were smoothed down with rongeur forceps. There was a fair-sized opening into the ethmoid and nasal cavity; this was thoroughly curetted and enlarged to the diameter of $\frac{3}{8}$ of an inch. There was an absence of a considerable part of the septum between the two frontal sinuses, so that a probe passed into the right frontal sinus $\frac{1}{2}$ inch beyond the midline. The right frontal sinus was then thoroughly curetted through this opening, much necrotic mucous membrane being found. The condition of the patient did not warrant further extensive operative procedures, and it was hoped that by what had already been done and by further intranasal treatment on the right side the wound would close and give no more trouble. After thoroughly flushing out both the wound, and the nasal cavity through the canal made into it, plain gauze

packing was placed (*a*) through the canal into the nose, (*b*) into the right sinus and in the wound which was left open entirely, and a dry dressing applied.

Subsequent History.—The patient did most satisfactorily following the operation. He had a good night, very slight pain; and required no stimulation. His pulse and temperature remained practically normal, the temperature once getting to 99° F.

April 24.—The drain through the nose was removed; all other drains were loosened; œdema was gone, conjunctiva was much better.

April 28.—The wound was granulating well; there was a very small amount of discharge; his condition was fine. The conjunctiva had cleared up. The patient could use the eye.

May 9.—The wound had healed over the eye; there was not much discharge. Since operation the nose had been irrigated from above through the inner angle of the wound. The left antrum was washed out through the inferior meatus but no pus was obtained.

May 26.—The wound had healed except at the inner angle close to the nose, where there was a small opening still persisting. It had not been possible to pass a probe into the right sinus from the nose nor had it been possible to pass any instrument down into the right nostril from the wound, although several attempts had been made with bent probes. Peroxide of hydrogen injected into the right frontal sinus through the wound did not appear in the right nasal cavity. At this time it seemed doubtful whether there was any communication between the cavity thought to be the right frontal sinus and the nose. It was thought that this cavity might have been an enlarged prolongation of the left frontal sinus. Transillumination of the right frontal sinus was not satisfactory and revealed nothing.

Attempts were made by cauterization with saturated solution of nitrate of silver to close the fistulous opening, but a small amount of purulent discharge still coming from it, it was decided that operative procedures would be necessary to obliterate the cavity in order to cause the cessation of the discharge.

Operation.—August 2, 1905; Manhattan Eye, Ear and Throat Hospital. Nitrous oxide and ether anæsthesia; time



FIG. 1.
1



FIG. 2.

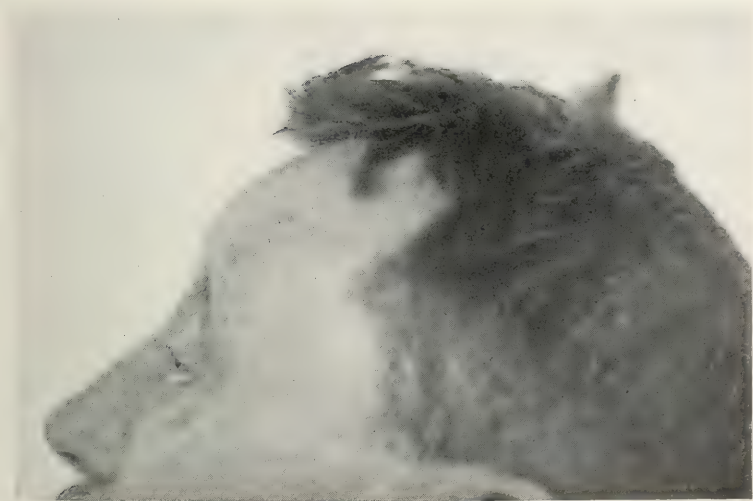


FIG. 3.

one hour. An incision was made from the fistulous opening directly across the bridge of the nose and curved out on the right supraorbital ridge to a point half-way between the inner and outer canthus. The skin and periosteum being elevated, the right frontal sinus was opened. It was found larger than was expected; extending outward to a point about halfway between the inner and outer canthus. There was considerable necrotic tissue in it. The anterior wall was removed entire and all projecting edges and irregularities were smoothed down. A probe was passed down apparently through the naso-frontal duct into the nose, but to my finger in the nostril it felt as though there was mucous membrane or perhaps slightly thicker tissue between it and the probe. The probe was pushed through this resisting tissue, and left in place while a post-nasal tampon was inserted. On the probe, as a guide, a small-sized bone curette was then passed down through the wound to the finger in the right nostril and the canal was curetted out. A strip of gauze was then carried through from above, brought out of the nostril and drawn back and forth, bringing away the debris of the curettage and enlarging the canal to nearly the diameter of the little finger. The necrotic tissue was then thoroughly curetted from the frontal sinus, from the canal leading to the old fistulous opening and all around this opening. All bony irregularities were removed and the cavities were made as smooth as possible. After thorough irrigation with boric acid solution, a plain gauze drain was passed into the right nostril from the right frontal sinus and one from the sinus out through the site of the old fistulous opening. The wound was then closed with interrupted silk sutures, except at the left angle where the fistula had been. Firm pressure was accomplished by dry compresses and a tight bandage.

The patient reacted from the operation well and left the hospital in a week. The wound healed satisfactorily except for slight stitch abscesses, which cleared up on the removal of the stitches and the application of a wet dressing for three days. The wound was irrigated a few days, the fluid coming out of the nose. The cavity was also irrigated from below through the canal which had been made through the ethmoid.

On August 19 there was absolutely no discharge from the old opening, which was getting very small, just admitting the

point of a probe and there was no discharge from the nose. The frontal sinus was apparently filling up satisfactorily.

On September 8 the wound had healed completely. There was no depression over the right frontal sinus; there was no discharge from the right nostril; there was a small drop of yellow pus at the site of the left middle turbinated which had been present from the beginning, and is due I think probably to a small amount of necrotic tissue in the ethmoid region. There was of course a marked depression over the left frontal sinus as the supraorbital ridge at its inner end had been removed. This is shown in the photographs.

Examination in December shows the condition the same except that a slight depression over the right frontal sinus exists.

I think the presence of some diseased tissue left in the right frontal sinus accounts for the failure of the wound to close after my first operation. There was no drainage from the right sinus into the nose, which may be accounted for either by excessive granulation tissue filling up the opening of the naso-frontal duct, or it may have been one of the cases in which the naso-frontal duct opens into an anterior ethmoid cell instead of into the middle meatus, or ends in a blind prolongation.

This latter view is rather supported by the fact that the probe which was passed through the naso-frontal duct in my second operation met with resisting tissue before it was passed through this into the nasal cavity. The rapidity with which the wound closed after the last operation forcibly illustrated nature's power of repair when irritating influences are removed.

If the patient's condition had been better I should have done a complete operation on both frontal sinuses at the first operation but his condition did not warrant more than was done at that time. I have reported the case and operations in full details as the conditions met were rather unusual. The very small amount of discharge from the left side which is still present is so slight as to be of no annoyance to the patient and the use of a cleansing spray daily makes him perfectly comfortable.

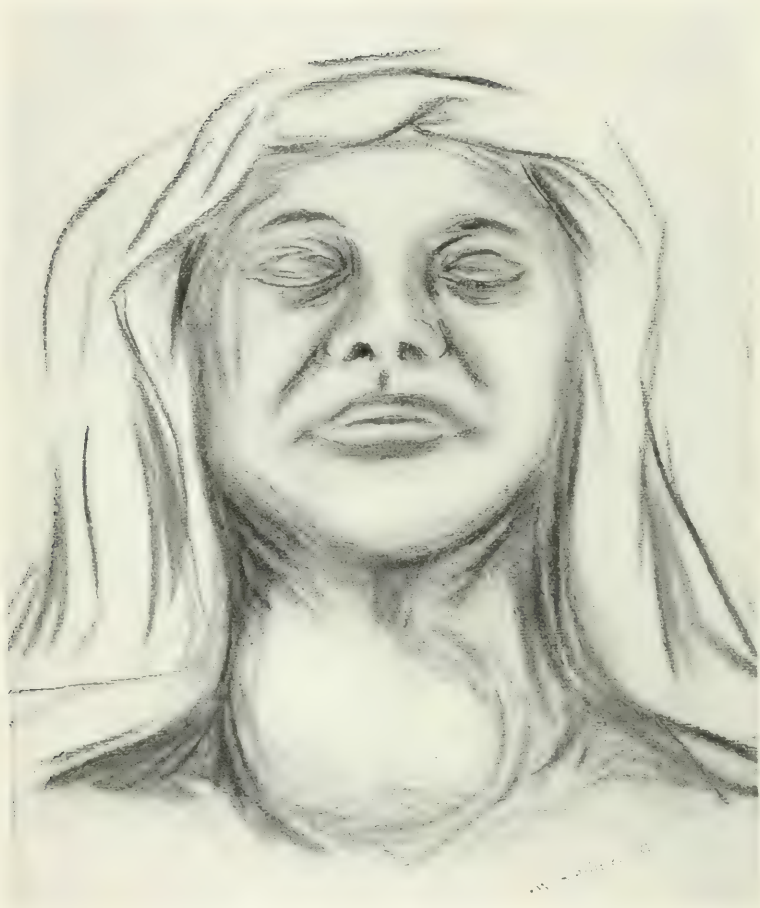


FIG. I.—Drawn from death mask of cystic adenoma of thyroid gland. Case 14729.
Jonn Seely Hospital. Medical Dept. University of Texas.

ANATOMY OF A CASE OF CYSTIC ADENOMA OF THE THYROID GLAND.

BY WILLIAM KEILLER, F.R.C.S. (ED.),

OF GALVESTON, TEXAS,

Professor of Anatomy in the University of Texas.

So seldom do we have the opportunity of making a complete dissection of a marked case of goitre that the writer feels no need to apologize for publishing the anatomic details of the following case and illustrating them by a complete series of figures.

The drawings were made from the body of a seemingly full-blooded negress, aged 55, case 14,729, John Sealy Hospital, said to have died of asthenia.

Fig. 1, showing the external appearance of the tumor, indicates the fat, well-developed character of the body. In the neck in the middle line and on either side of it, extending from the hyoid bone to the sternum, is a tumor which is so prominent on the right side as to rather obscure the evidence of swelling on the left. The sternomastoids are somewhat separated by the growth and overlap it at the sides. The tumor is globular and shows indications of lobulation. Its right half is roughly 7 c.m. broad and 8 c.m. long in its greatest diameters, while the left half does not lend itself readily to measurement. The right half of the tumor overlaps the middle line.

On dissection the skin was found to be freely movable throughout, the platysma on each side somewhat hypertrophied and the platysma muscles interlaced with each other below the hyoid. The anterior jugular veins were perfectly normal and did not seem to be enlarged. On reflecting the platysma the superficial layer of the fascia lata presented no peculiarity. It had the usual attachment to the hyoid bone, enclosed the sternomastoid on either side and split inferiorly as usual into two layers attached to the anterior and posterior lips of the upper border

of the sternum and between the layers was the usual vein uniting the two anterior jugulars.

Fig. 2 shows the deep fascia reflected to expose the first layer of infra hyoid muscles and sternomastoids. The right sternohyoid which covers the larger lobe of the tumor is very much hypertrophied, especially in its breadth, the muscle measuring 5.5 c.m. across at its broadest (about midway between the hyoid and sternum) and narrowing at either end. It is just about twice the size of the normal muscle. Both omohyoids are markedly hypertrophied, the left sternohyoid not so, but here I may be in error as the left side of the tumor was exposed in embalming the body and the coverings damaged. The tumor is seen to dip beneath the sternomastoid on either side. No large vessels are apparent. Between this layer of infrahyoid muscles is a distinct layer of fascia stretching between and splitting to enclose them. It is the normal layer of fascia which unites these muscles and can scarcely be said to be hypertrophied. Thus we have in it a second layer of deep fascia over the tumor.

In Fig. 3 the sternohyoids, and omohyoids have been reflected, their fascia removed with them. The anterior edge of each sternomastoid has been deeply incised and the muscle partly drawn aside. The tumor is now found to be enveloped in a third distinct and in this case somewhat hypertrophied layer of fascia into which the sternothyroid muscles are inserted. These muscles are much hypertrophied, being each 5 c.m. broad at its sternal attachment. Each muscle extends as a muscular belly for about 4 c.m. upward from the sternum and is then lost in the fascia. There is no trace of an attachment of muscle or fascia to the thyroid cartilage, the fascia seems to have been stripped off the thyroid cartilage and retains its attachment only to the hyoid bone. No large vessels are yet to be seen except at each upper and outer angle of the tumor, where the superior thyroid vessels can be made out enveloped in fascia. The fascia laterally blends with the sheath of the sternomastoid. On the right lateral surface of the right lobe of the tumor a deep groove divides it into two masses. In the upper end of the groove a small portion of the upper end of the right sternothyroid muscle will be found (see Fig. 5).

In Fig 4 the sternothyroid muscles and the fascia belonging to



FIG. 2.—First layer of muscles.

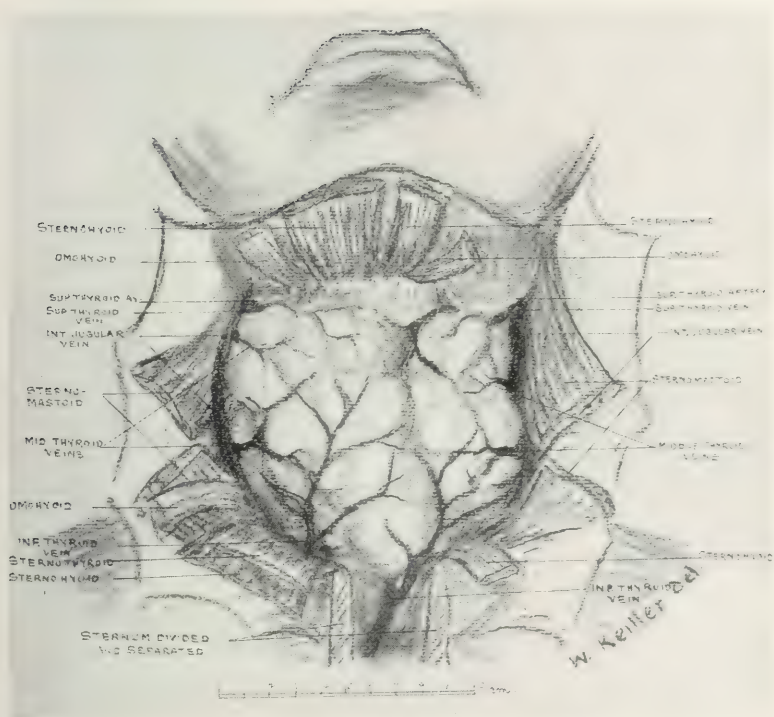


FIG. 4.—Muscles reflected. Capsule of tumor exposed.

them which were found to form a complete anterior investment for the tumor have been reflected and the proper capsule of the goitre has been exposed. The sternum has been cut longitudinally and the superior mediastinum opened the better to investigate the lower relations of the tumor. For the first time important vessels are encountered and the tumor, freed from its compressing investments, seems larger than in any previous stage of the dissection. The tumor is now seen to consist of a right and a left half, each further sub-divided and all enveloped in the same capsule. The right half of the tumor presents a posterior portion, elongated and shaped like an enlarged lateral lobe of the thyroid. It appears to be free from cysts and looks like simple adenomatous tissue (simple hypertrophy). All the rest of the right half and the whole of the left half of the tumor are markedly cystic, the globular prominences of the individual cysts being very numerous. The whole surface of the tumor is covered by a dense network of large veins whose size cannot rightly be estimated in their empty condition. They are imbedded in and almost inseparable from the capsule and the figure only gives a faint idea of the larger vessels. The internal jugular veins are pushed outward by the tumor mass, and each vein is as it were anchored to the capsule by three large branches, a superior thyroid vein at the upper angle of the mass (about the usual level of the vessel) and two middle thyroid veins, the lower of which is about at what should be the level of the cricoid cartilage, while the upper seems an accessory vein and lies at what should nearly correspond with the upper border of the thyroid cartilage. Rather deeply under cover of the sternum and springing from the inferior angles of each lateral lobe of the growth are two large inferior thyroid veins. These veins all anastomose freely over the surface of the growth and send great branches in between its lobes. Excepting the main trunks they are thin walled and imbedded in the capsule. The trunks of these veins are enlarged, suggesting in size average median or ulnar veins as they appear at the elbow. Enveloped in the capsule of the tumor at each upper lateral angle is the only artery so far met with, namely, the superior thyroid. It is accompanied by the superior thyroid vein and is distinctly enlarged. Each superior thyroid artery sends a branch over the surface of the tumor but

passes mainly to its deep aspect. Its relations are practically normal and it is easily accessible to ligature. Coursing over each lateral surface of the tumor is the ansa hypoglossi, which has been dissected out of the fibrous capsule belonging to the muscular layer.

In Fig. 5 the two halves of the tumor have been separated to show its deep relations. In incising the capsule along the line of division between the two halves of the tumor many veins required double ligation before being cut. This done, the two portions were separated so as to get at the deeper vessels. The superior thyroid arteries with companion veins were divided between ligatures on the side of the thyroid cartilage; the inferior thyroid arteries were ligated on the sides of the trachea. The relations and dimensions of the isthmus thyroidei unfortunately could not be made out with certainty, as it had been damaged in embalming the body. I think it was comparatively small (probably 1 to 1.5 c.m. in diameter) and firmly adherent to the first two rings of the trachea, a large branch of each inferior thyroid artery closely associated with it. The two segments of the goitre having been separated as in Fig. 5, the trachea and larynx are exposed. The tumor being bilateral there is no appreciable bending of the trachea, though there may be some slight narrowing. None of the rings are softened. A little separate cyst has remained attached to the front of the trachea in association with the right inferior thyroid vein. It is an accident of dissection and is not especially adherent. By fully retracting each half of the goitre the carotid sheath is exposed on either side. The vessels have been markedly displaced outward by the tumor. From under each carotid sheath 2 to 3 c.m. above the level of the sternum the trunk of each inferior thyroid artery is seen to emerge. Each artery divides into an ascending and descending branch, the latter going one to each lower angle of the goitre and joining there the corresponding inferior thyroid vein; while each ascending branch enters its own lobe close to the isthmus. The ascending branch of each inferior thyroid artery on the side of the trachea is in close relation to the recurrent laryngeal nerve, a point of the utmost surgical importance. The dissection shows that the inferior thyroid arteries might be ligated without danger to the recurrent laryngeal nerves either where they enter the

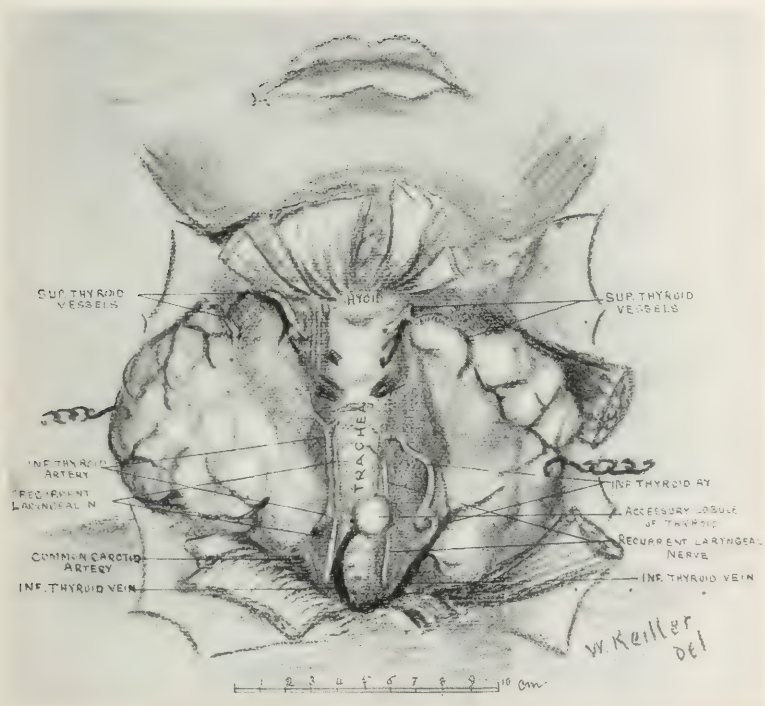


FIG. 5.—Tumor divided, trachea and vessels exposed.

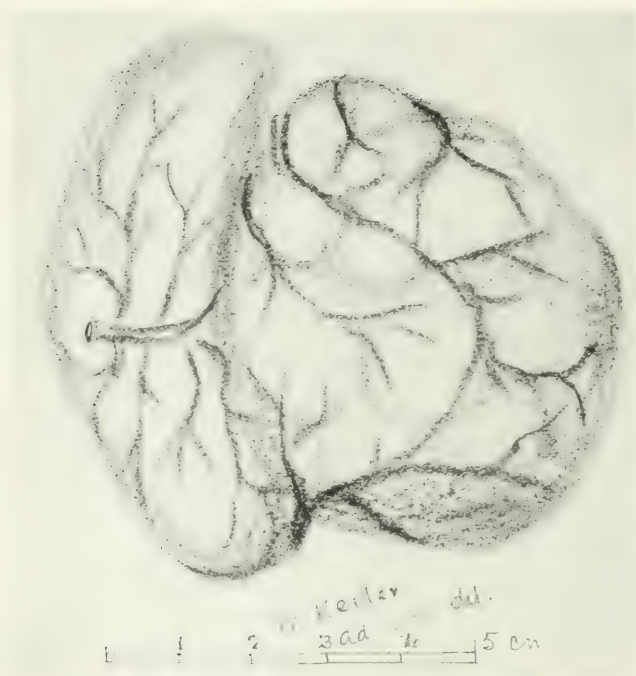


FIG. 6.—Outer surface of right lobe of hypertrophied thyroid.

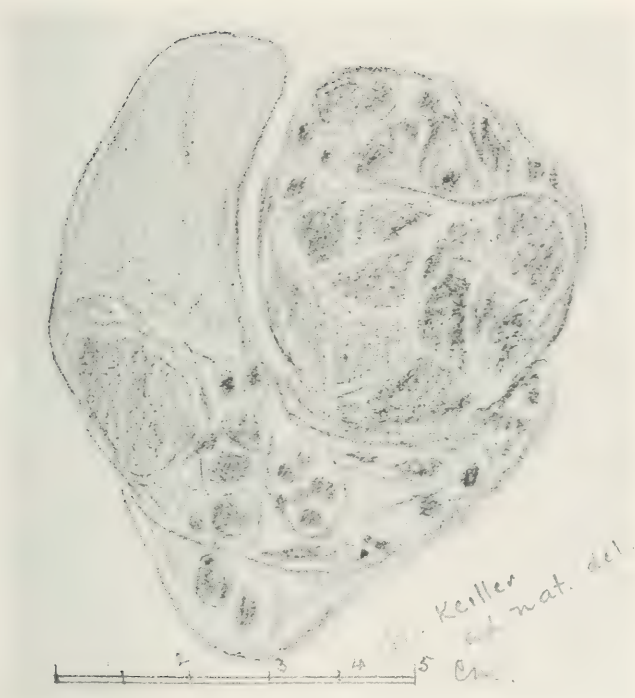


FIG. 7.—Section of right lobe of cystic thyroid gland.

tumor at the antero-lateral borders of the trachea (and here there would be at least two large branches, an upper and a lower previously described, to be ligated for each inferior thyroid artery), or the trunk of each vessel might be safely ligated as it emerges from under the carotid sheath. The trunk of the sympathetic is not visible. Dissection shows that its close relationship to the carotid sheath in which it is imbedded has caused its displacement outward with the common carotid artery. The superior thyroid artery and companion veins are easily accessible to ligature, as they course over the upper angles of the tumor. I could find no thyroidea artery. Further dissection shows two large inferior thyroid veins, one opening into each innominate. Their trunks would be easily accessible, as the lower angle of each half of the growth is raised. The other veins are more accessible from the outer surface of the tumor as shown in Fig. 4.

It will be seen that there is a distinct difference in character between the deep and superficial portions of the right half of the tumor, the superficial part being a congeries of cysts, the deeper seemingly simply adenomatous. The section however shows that the deep portion of the tumor is also markedly cystic in its lower segment. A small upper part of the right sternothyroid is seen attached to the thyroid cartilage and reflected upward. It was found occupying the angle between the deep and superficial parts of the tumor superiorly and attached to the capsule formed from the fascia of the sternothyroid muscles (compare Fig. 4).

Fig. 6 is a drawing of the outer surface of the right lobe of the thyroid. The arrangement of one of the middle thyroid veins is well seen, of the superior and inferior thyroid veins, and also the difference in superficial appearance between the smooth posterior portion and markedly lobulated anterior portion of the growth. Fig. 7 shows that on section the difference is more apparent than real, the upper part of the posterior mass being the only portion free from cysts. The lower half of this portion of the tumor shows one large and many small cysts imbedded in a groundwork of simple adenomatous tissue; while the anterior part of the growth is one great mass of cysts with septa so thin as to be barely appreciable. All the vessels visible to the naked eye are in the capsule.

The left half of the tumor differs from the right half in presenting on its upper three-fourth an enormous number of smaller cysts, varying in size as seen by the naked eye from 2 m.m. to 3 c.m. in diameter. All these are evidently compound, each larger cyst being composed of many smaller ones whose capsules are thinning out toward obliteration, the capsule of the larger cyst being thickened. The lower fourth of this lobe has some normal gland in which are many small cysts. There were no post-esophageal or mediastinal extensions of the tumor. Microscopically the growth is a cystic adenoma of the thyroid gland.

The main points to be remembered in removing nonmalignant tumors of the thyroid body are:

(a) The danger from hemorrhage which is mainly venous, and constitutes one of the chief risks.

(b) The danger to the inferior laryngeal nerve.

(c) The danger of compressing the trachea or its collapse if its rings be softened.

(d) The danger of a peculiar postoperative toxemia probably from absorption of thyroid secretion, which is according to most operators greatly increased by much pressure on the tumor during its removal.

(e) The danger of myxedema if the whole gland be removed.

Bearing these points in mind the dissections in this case seem to me to teach the operator the following lessons:

Easy access is essential to safe and speedy removal and with this in view, I would use a V incision, the upper limbs of the V beginning at the anterior border of each sternomastoid a little below the level of the angle of the jaw when the head is thrown back, and following the anterior border of each muscle and meeting about one inch above the sternum in the middle line. In this incision skin and platysma should be cut, large branches which frequently unite the anterior jugulars with the external jugulars looked for under the platysma and divided between ligatures near the upper angles of the wound, the anterior jugulars themselves farther down, and the vein joining them just above the sternum. The next incision should

be exactly along the same lines, should cut the omohyoids and sternohyoids as far from their hyoid attachments as will admit of picking up the lower ends and reuniting them at the end of the operation.

The next sweep of the knife should take in the sternothyroids and the sheet of fascia which stretches between these and thence to the sternomastoid over the tumor (see Fig. 3). No large vessels should be encountered so far (except the anterior jugular veins and their connections). It might be possible with care to avoid the *ansa hypoglossi* supplying the hyoid depressors and thus preserve these muscles. The nerves should be found descending obliquely to the hyoid depressors over the carotid sheath in the upper two inches of the incision on either side. With the view to saving these nerves and also to avoid injury to the veins of the immediately underlying special capsule of the goitre I would start with careful division of the muscular belly of the sternothyroid above the sternum and follow the fascia up cautiously on either side. This last incision should enable the operator to throw up a flap consisting of all the hyoid depressors and the fascia connecting them which would fully expose the thyroid gland in its proper capsule. So far bleeding should have been easily controlled. The head should now be bent forward to relax any pressure on the veins which course over the goitre, and its general relations can be thoroughly examined to determine the extent and method of removal. Remembering the importance of avoiding pressure on the trachea and in the light of the dissection before us (Fig. 5) it would seem best to begin by dividing the veins and capsule between ligatures over the median dividing line between the right and left segments of the growth. No vein should be cut without being first ligatured, lest it retract within the capsule and be troublesome to catch again. Thus the two halves of the tumor could be separated, the trachea exposed, and the character and relation of the growth made out. In this case one would readily see the comparatively healthy character of the deep portion of the right half of the tumor, and the superficial cystic portion could be removed by ligature of the superior thyroid vessels at the upper and inner angle, of the upper branch of the inferior

thyroid artery in front of the trachea near the isthmus, of the inferior branch of the inferior thyroid artery and the inferior thyroid vein at the lower angle of the tumor well forward and out of the way of the recurrent laryngeal nerve. Turning the gland now to the inner side cautious division of branches of the middle thyroid veins between ligatures would enable the operator to remove the superficial cystic portion of the growth. Nothing should be cut except between ligatures.

My uncertainty about the isthmus in this case does not enable me to argue from this dissection; but the experience of surgeons would suggest the division of the isthmus between ligatures as a step to be taken as soon as that part is fully exposed. The general cystic condition of the left lobe, taken together with the comparatively healthy character of the deep portion of the right lobe which we have resolved to preserve, should determine the complete removal of the left half of the goitre. The inferior thyroid vein is ready of access and should be first ligated and cut at the lower angle of the tumor. Rolling the tumor gently outward the inferior thyroid artery will be readily and safely accessible as it emerges from under the carotid sheath, thus avoiding risk to the recurrent laryngeal nerve which is close to the trachea. The superior thyroid vessels can now be taken at the upper angle of the growth; and lastly, turning the mass toward the middle line the middle thyroid veins will be ligated and divided as far as possible from the internal jugular. The cysts which our section reveals at the lower angle of the part we have resolved to leave need not trouble us, as experience teaches that they are likely to atrophy after operation. In closing the wound the depressors of the hyoid bone should be stitched together to preserve their function, and the danger attending the absorption of the thyroid secretion, the risk of venous oozing, and the difficulty of complete obliteration of the postoperative cavity suggest the necessity of gauze drainage at the lower angle of the wound. Elevation of the lower end of the bed and avoidance of a pillow might lessen the risk of mediastinal infection.

THE RESULTS OF THE SURGICAL TREATMENT OF EXOPHTHALMIC GOITRE.¹

BY B. FARQUHAR CURTIS, M.D.,

OF NEW YORK,

Professor of the Principles of Surgery in the University and Bellevue Hospital Medical College ; Surgeon to St. Luke's and Bellevue Hospitals.

IN a paper read before the American Surgical Association in 1903 (ANNALS OF SURGERY, 1903, xxxviii., p. 161) the writer reported the results of eighteen cases of exophthalmic goitre operated upon by him, and his present desire is to give later reports on some of these cases and to add three recent cases. It is perhaps worth mentioning that there has been an apparent increase in the opposition to surgical treatment although the results of non-operative measures have not improved very much in spite of the use of various serums and of the Röntgen ray. Both the latter methods, as well as Abbé's method of burying a tube containing radium in the gland, are on trial as yet, for it is too early to know how complete and how permanent the results may be. The arguments of some of the medical authorities seem hardly fair. Eulenburg (*Deutsche Klinik*, 1904, vi. 744), for instance, making the extraordinary statement that patients do not die of exophthalmic goitre, a statement which hardly needs contradiction. We readily acknowledge that the majority of cases yield to medical and hygienic measures if the circumstances of the patient admit of proper treatment being fully carried out. But these conditions often cannot be fulfilled and many cases also are severe and resist treatment obstinately even from the beginning.

In the writer's opinion surgery should be reserved for severe cases which have resisted medical treatment, but this does not mean that it should be undertaken as Eulenburg wishes as a last resort and forlorn hope, for there can be no doubt

¹ Read before the Pennsylvania State Medical Association, September 27, 1905.

that the mortality is greater in the bad cases than when the symptoms are slighter and the patient is in better condition. On the other hand we cannot advocate immediate and early operation in every case, because many recover with medical measures alone, and because there is a mortality to operations even in the comparatively light cases, although the risk is less than in the serious ones.

The only operations which need be considered are partial thyroidectomy, and extirpation of the cervical sympathetic nerve and ganglia. Ligature of the thyroid vessels has a palliative effect and is especially useful as a preliminary to thyroidectomy.

Sympathectomy was first advocated by Jonnesco (Balacescu, *Arch f. klin. Chir.* 1902, lvii. p. 59). Hoping to avoid the acute thyroid poisoning which had made the mortality of his thyroidectomies so high, the writer tried sympathectomy in seven cases, but met with the same ill-fortune, two deaths occurring from acute thyroidism and one from the anæsthetic. Full details of these cases are given in the paper already alluded to. Of the four patients who recovered, the following report is made up to the present time. The numbers are those of the previous paper.

CASE XII.—M. F., female, 25 years old. Operation, May 17, 1899; middle and inferior ganglia of the cervical sympathetic removed on both sides. May 5, 1904, five years after operation, she was examined just after recovery from an attack of grippe. Pulse 70 to 90 while in bed, and even when the temperature had been 104, the pulse only reached 100 to 108. Thyroid gland normal in size and consistency. The eyes were normal, pupils dilated. The heart was normal, without murmurs. She had no tremor, was not nervous, slept well and had been able to work.

CASE XIV.—M. B., female, 28 years old. Operation, December 2, 1902; all sympathetic ganglia removed from both sides of neck. Primary union followed by immediate improvement of all symptoms. October 11, 1903.—Thyroid gland enlarged again, median lobe as large as a hen's egg. Pulse 138. Coarse tremor of fingers. January, 1904.—Improved since last note until the present, but is suffering from an attack of grippe and is much

worse. March, 1904.—Very ill. When put to bed, pulse dropped to 60 and so remained, but with poor force. Ran a high fever, without leucocytosis, and died March 20. Autopsy revealed an acute endocarditis without other lesions of importance.

CASE XV.—E. F., female, 23 years old. Has had exophthalmic goitre for two years, and had thyroidectomy of right half performed about one year before, with temporary improvement, then relapsed. Extreme exophthalmos, pulse 110 to 150, very nervous, tremor, dyspnœa. Operation, December 2, 1902; all cervical ganglia of the left sympathetic removed; December 19.—Same operation on right side. Immediate improvement. September 11, 1905.—Is doing full work as chambermaid. Rides a bicycle. Sleeps and eats well. Neck smaller, measuring $11\frac{1}{2}$ inches. Pulse 120 while standing after walking. Eyes improved, left being no more noticeable than an ordinary myopic eye, right rather more prominent. No tremor or twitching; manner quiet; face does not flush.

CASE XVII.—L. W., female, 26 years old. Operation, January 17, 1903; all cervical sympathetic ganglia of both sides removed. May 11, 1903.—Neck measures $15\frac{3}{4}$ inches. Exophthalmos is less, can shut right eye completely, left eye almost, convergence normal, eyelids follow eyes downwards. Pulse 100. Feels well. February 13, 1904.—Her physician reported that patient has developed nephritis and a cardiac lesion, and has had œdema of the limbs for three to five weeks. The goitre has shrunk during this illness. Early death was expected.

Of these four cases, then, one relapsed within nine months, and a little over a year after the operation, she died of the original disease with an acute endocarditis. One case was completely cured five years after operation. One case was almost cured and still improving when she acquired nephritis about one year after the operation, and has probably since died. The remaining patient is able to do her work and enjoy life without medication, although goitre, exophthalmos, and slight tachycardia persist—a practical cure. We may safely conclude that the ultimate results of sympathectomy are fairly satisfactory. But the operation is much more difficult than thyroidectomy, not so easily done with local anæsthesia,

and the mortality is fully as high. Moreover, the scars come so high up that they are more disfiguring, by no means an unimportant factor, as the patient's employment often depends upon her appearance. For these reasons the writer has again turned his attention to thyroidectomy.

Three new cases have to be reported here.

CASE XIX.—Fanny C., single; United States; 28 years old; teacher. Was first seen by me in May, 1903, and her condition was so serious that I insisted on several months of rest and medical treatment before operating. October 19, 1903, she was admitted to St. Luke's Hospital in much better condition. Menstruation had been irregular and scanty. Nine years previously she had first noticed a swelling in the median line of the neck, which had gradually increased and for the last three years had interfered somewhat with swallowing. No nervous symptoms or dyspnoea at present. Slight exophthalmos. Eyelid follows eye in looking down. Thyroid gland considerably enlarged, with expansile pulsation, and with a murmur to be heard all over it. The largest circumference of the neck is $14\frac{1}{2}$ inches. The strong pulsation of the heart is visible all over the præcordium. There is no hypertrophy. A loud systolic murmur is heard, especially at the apex. Lungs, examination negative. There is a fine tremor of the fingers. Pulse 84 to 120. Operation, October 20, 1903. Cocaine local anæsthesia. Ligation of right inferior thyroid artery. Cervical sympathetic nerve divided near second ganglion. Wound sutured and drained. Pulse 100. October 21.—Pulse 124, and temperature 104° at the highest. The right pupil is contracted, there is slight ptosis of the right lid, and that side of the face is flushed. The pulse reached 100, and the temperature was normal, on the fourth day. Primary union was obtained, the drain sinus being closed by the 26th. October 28.—Operation. Right superior thyroid artery ligated under local anæsthesia. There was but little febrile reaction and primary union was obtained. November 6, the goitre was smaller, the pulse lower, and the nervousness gone. December 6, 1903.—Pulse 84 to 120. Greatest circumference of neck $13\frac{5}{8}$ inches. December 7.—Operation. Left inferior thyroid artery ligated under local anæsthesia. The pulse was 132 and the temperature 102° at the highest, and became normal in

three days. December 14.—Operation. Left superior thyroid artery ligated under local anæsthesia. After slight reaction the pulse and temperature became normal in three days. Primary union was obtained in both wounds, although a hematoma formed in the second. She continued to improve, but I advised thyroidectomy to guard against a relapse.

March 21, 1904, she was readmitted to St. Luke's Hospital. The pulse was 80 to 100, rising to 120 on exertion. April 1, 1904.—Operation. The right half of the thyroid gland was removed, by an oblique incision following the other scars. The skin was incised with local anæsthesia, and the operation begun. But there was very troublesome venous oozing, requiring the actual cautery to check it, and the parts were so sensitive as to make deep dissection very painful, and chloroform was administered. This was well borne, the pulse being only 116 at the end. The wound was sutured and drained. Eight hours later the temperature rose to 102° and the pulse to 140. The following day the pulse was 150 and the temperature 101³/₅ at the highest. The urine, always previously normal, contained one per cent. of albumin. There was restlessness and nausea. Primary union was obtained. April 28.—The pulse is 100 while standing after walking. Greatest circumference of neck is 12 inches. No tremor. Sleeps and eats well. September 20, 1905 (about eighteen months later), she reports that she is feeling perfectly well and is going on with her work. Pulse 70. Menstruation regular during last year. Has married and lost her husband in the past year.

CASE XX.—Annie C., 28 years old; single; born in United States. When first seen was in poor condition and was treated by her physician for three weeks with rest, icebag to the heart, aconite diet, etc., with considerable improvement. April 19, 1905, admitted to the General Memorial Hospital. She had always been nervous. Menstruation regular, formerly profuse, latterly less so. For last year has been very nervous and has had severe frontal headache. Neck has increased in size. She has had pronounced tremor and twitching of the extremities and palpitation of the heart. Pulse now 105 to 112. (When first seen was 130). No albumin in urine. The exophthalmos is slight, the enlargement of the thyroid moderate. The patient is extremely nervous, and the tremor very well marked.

Operation, April 20, 1905.—Cocaine anæsthesia was tried, but patient was hyperæsthetic and absolutely uncontrollable, trembling and twitching, yet eager to have the operation carried out. Chloroform had to be administered after the skin had been incised, and the operation was rapidly completed, the right half of the thyroid gland being removed. The wound was sutured and drained. The patient was somewhat cyanotic and the pulse was 145, respiration 44, and temperature 101° when she was put to bed. About eight hours after the temperature had reached $102\frac{2}{5}^{\circ}$. At noon next day the pulse was said to have been 230, respiration 58, and patient was thought to be dying, but rallied and was able to talk and acted rationally all the afternoon. The temperature, however, rose to 104° , the pulse running 144 to 165; the respiration became more labored, and she died about forty hours after the operation. Albumin and hyaline casts were found in the urine after operation.

CASE XXI.—Maud W., 24 years old; single; born in United States. Admitted to General Memorial Hospital April 11, 1905. Menstruation regular. Had nervous prostration for three months, two years ago. Four years ago throat began to enlarge and has steadily increased in size. Now the greatest circumference is $14\frac{1}{2}$ inches. Four months later became nervous and exophthalmos began, increasing ever since. In last two years has grown less nervous. Since her neck swelled, has had moderate dyspnoea on exertion, and mild palpitation of the heart. Sleeps well. Has several times had attacks of great nervousness and restlessness with high fever. Pulse 110 to 130. Heart apex beat normal, with marked pulsation of præcordium. Reduplication of valve sounds and confused indefinite murmurs. Systolic murmurs in both carotids. No thrill. There is extreme exophthalmos, so that the lids do not close by a space of one quarter of an inch, and do not follow the eyes in looking down. There is moderate nervousness, patient having good self-control. Slight tremor of fingers. Moderate enlargement of the thyroid gland. Two weeks were spent in preliminary treatment in bed with icebag to heart, bromides, aconite, and limited diet (no red meat). Operation, April 25, 1905. Under cocaine anæsthesia, the right superior thyroid artery was ligated. Wound sutured without drainage. The temperature rose to $102\frac{3}{5}$, pulse 134, next day, and was three

days in falling to normal, but primary union followed, with immediate though slight improvement in the patient's subjective symptoms, especially the loss of strained feeling in the eyes. May 1 she could close the eyelids completely. Pulse 90 to 100. May 5, 1905, operation. Under cocaine anæsthesia the right half of the thyroid gland was removed. The parts were very sensitive, requiring much cocaine, but the patient was very courageous and patient. The wound was sutured and drained. There was a marked febrile reaction, temperature 102° and pulse 134, with gradual fall to normal. Primary union was obtained except in the drain-sinus, which discharged a sticky serum abundantly and was still open when patient was discharged two weeks later. All symptoms were immediately improved. September 8, 1905, she writes that she considers herself well. Pulse 72-84. No dyspnœa. Eyes less prominent. Sleeps well. Still has slight tremor of fingers.

The previous paper contained a study of the condition of acute thyroidism, which has been the cause of death in almost all my fatal cases. Acute thyroidism is marked by a rise of temperature with exacerbation of all the ordinary symptoms of the disease. In all six fatal cases there was albuminuria also, but in only two of these was it present before operation. If found, albuminuria would furnish a strong reason for declining operation. One case of thyroidism which recovered had albuminuria. The cause of this condition is not yet definitely known. The most popular theory ascribes it to absorption of the thyroid material from the wound, but this explanation is altogether too crude to be acceptable. In the first place, attacks of acute thyroidism are seen in the usual course of the disease when the patient is leading an ordinary life, or under general treatment only, without any local measures.

Secondly, any nervous excitement, a fright, anxiety, even ordinary business worry will often bring on an attack. If there is a history of such attacks as in Case XXI, especial precautions are necessary in undertaking surgical treatment. In one of my cases the symptoms set in a couple of hours before the time appointed for operation and the latter was

postponed. It cannot be claimed that in this case the crisis was due to rough handling of the gland during the usual antiseptic preparation of the neck, for the latter had taken place over twelve hours before. Fatal thyroidism followed the operation in this case.

Thirdly, the symptoms are seen just as frequently after sympathectomy as after thyroidectomy, and also after operations done on distant parts of the body in patients with exophthalmic goitre; for instance, ovariectomy (two cases), appendectomy, amputation of the breast, tonsillotomy, uterine curettage, tooth extraction. (See Sanderson, *Amer. Medicine*, 1905, ix. p. 197, and Mayo, *Medical Record*, November 5, 1904.

The so-called aseptic fever following operations without infection, or with so little infection that primary healing of the wound is not prevented, a fever which in the ordinary individual produces very slight disturbance, might very well be much more serious in persons with exophthalmic goitre, and this suggests a partial explanation. In a study of aseptic fever some years since (*Medical News*, June 24, 1899) the writer suggested the possibility of operative shock causing a rise of temperature like aseptic fever under some circumstances, and he believes that there is an element of shock in acute thyroidism. The causes of acute thyroidism are probably complex and include the nervous strain of undergoing an operation, the disturbing effects of general anæsthesia on various functions of the body, the shock of the operation itself, and the absorption from the wound of toxic materials—quite as much as the chemical bodies produced by minimal septic infection as the products of the thyroid gland.

In the former paper the conclusion was reached that general anæsthesia was to be avoided, and shock reduced by every means possible in order to escape acute thyroidism. In the three recent cases this was attempted by employing cocaine anæsthesia, and by dividing the operation into several sittings. In two cases this produced excellent results; in the third general anæsthesia had to be employed, and although chloroform was used, acute thyroidism promptly followed, and death ensued. If chloroform had been administered to the last patient, and

a thyroidectomy done without preliminary ligation, it seems certain that death would have resulted, for even the comparatively slight operation of ligation of the superior thyroid artery under cocaine anæsthesia was followed by severe febrile reaction.

Experience thus favors the earlier conclusions. In addition to the advice to divide the operation by performing preliminary ligation of the arteries, and to use local anæsthesia, I would now add that it is advantageous if not absolutely necessary to have the preliminary treatment by rest in bed, icebag to heart, bromides, etc., carried out at the hospital where the operation is to be done, in order that the patient may learn to know and trust the surgeon, and to like the nurses, growing familiar with her surroundings. This adds greatly to the efficiency of the control of the patient under local anæsthesia.

Reviewing the results of thyroidectomy, we have in all fourteen cases with four deaths, all from acute thyroidism. In addition to the two recovered cases just reported, final reports on the cases in the former paper are as follows:

CASE I.—L. E., 24 years; female. Operation November 11, 1893; right half of thyroid removed. September 1905, twelve years after, continues well. Pulse 80, eyes still somewhat prominent, no tremor or palpitation. Is running a millinery business.

CASE III.—S. B. H., female; 43 years. Operation October 2, 1894; right half of thyroid removed. September 1899, five years after, has been doing hard work and feels well. Nervousness almost gone. Pulse 100. Eyes still prominent but much improved.

CASE IV.—A. B., female; 21 years. Operation November 29, 1895; left half of thyroid removed. Six months later patient was perfectly well, the pulse being 74; no nervousness or insomnia (Booth).

CASE V.—N. C., female; 17 years. Operation December 17, 1895; right lobe of thyroid removed. 1902, seven years later, no nervousness, palpitation or exophthalmos, pulse 90.

CASE VI.—A T., female; 35 years. Operation January 11, 1896; left half of thyroid removed. 1898, two years after operation all nervous symptoms had disappeared, pulse was 84.

CASE VII.—R. W., female, 27 years. Operation October 13, 1897; right lobe and upper half of left lobe of thyroid removed. Immediate improvement, pulse 98, but patient has not been seen since.

CASE IX.—M. C. C., female; 18 years. Operation January 28, 1897; right half of thyroid removed. Improved, but relapsed. January 12, 1899.—Left superior thyroid artery ligated. Improved. In 1902 the improvement continued, but lately she has relapsed and now has severe symptoms (1905).

CASE X.—M. E. McK., female; 36 years. Operation November 13, 1897; left half of thyroid removed. April, 1902, was practically cured, less nervous, no tremor, eyes hardly noticeable, pulse 80 to 90, and was working hard as a bookkeeper. September, 1905, she continues well.

Of the ten patients who recovered from operation, one was improved but has not been seen since. One case was improved for two years, relapsed, later had one artery tied on the other side with improvement and again relapsed. Eight cases can be claimed as practically cured, having been followed six months (two cases), eighteen months, two years, five years, seven years, eight years, and twelve years. Two of the cases were slight, but the rest were serious and some in a dangerous condition. The four patients who died were all advanced cases. These results are encouraging, and partial thyroidectomy has apparently yielded better results than sympathectomy. But in one of my cases the latter has effected a practical cure after a relapse following thyroidectomy. On the other hand a relapse with fresh enlargement of the thyroid occurred in one case after sympathectomy, and perhaps a thyroidectomy would have brought about a cure here if we had been able to get the patient's consent. A temporary improvement was obtained in one of the relapsed cases by ligation of one artery on the other side, the improvement lasting two years or more.

This question of the proper treatment of relapsed cases is very interesting. Schulz (*Beitraege zur klinische Chirurgie* xxx. p. 638, 1901) had three cases relapse out of twenty treated by partial thyroidectomy, and operated a second time upon

the remaining portion of the gland, obtaining two cures. The other patient relapsed again and he was persuading her to submit to a third operation, as in his first operation he had merely shelled out a nodule, without actually resecting the gland. He states that in every case of relapse the remaining portions of the gland have undergone further enlargement. This continued growth of the gland also occurred in my two relapsed cases, and it seems to indicate that another partial thyroidectomy would be the proper treatment, provided that enough thyroid could be left to prevent cachexia strumipriva. If the patient upon whom I did a sympathectomy for a relapse following thyroidectomy remains as well as she is now (nearly three years after operation) we might suggest sympathectomy as an alternative when thyroidectomy was not considered wise.

The effect of the operation upon the various symptoms is interesting.

Eyes.—The exophthalmos is generally immediately lessened, but seldom entirely disappears. There may be a hypertrophy of the connective tissue of the orbit in long standing cases which is never entirely reabsorbed. But even when the exophthalmos continues the patients are at once relieved of the strained feeling of which they generally complain and the expression is less staring. The eyelids can be completely closed and they follow the eyeball properly in looking down.

Thyroid Gland.—In successful cases the remaining part of the gland is stationary or even diminishes in size. A relapse is accompanied and sometimes preceded by an enlargement of this remainder.

Circulation.—The pulse generally responds early, being reduced in frequency, and gaining in regularity and force as soon as the post-operative reaction has passed. In Case VI the pulse fell from 120 to 90 during the operation, becoming more rapid again, while the febrile reaction lasted, then falling permanently below 90. But in many cases the tachycardia persists, the pulse running 90 to 100 at rest and even reaching 120 on exertion, yet the patients feel so much relieved of the former tumultuous and irregular heart action that they consider themselves perfectly well and go about their regular lives without medication.

Nervous System.—There is an immediate improvement in the tremor, nervousness, excitability and insomnia, with a complete loss of the feeling of anxiety so common in this disease. The patient often notices this effect and speaks of it even on the day after operation, although it is not marked generally until after the postoperative reaction has subsided.

An indiscriminate collection of cases from literature would not give an accurate picture of the results obtainable by operation. But we can combine the figures of Schulz,¹ Kocher,² Mayo,³ and Hartley⁴ with my cases, making a total of 136 cases treated by thyroidectomy, with 17 deaths, chiefly from acute thyroidism. Four relapses are noted in this list, and several cases were lost sight of early. (Mayo gives no data to allow of proper classification of his cases) but there appear to be over one hundred cases cured, or practically cured. It has been said that the operative successes represent the periods of temporary improvement so often seen in exophthalmic goitre with or without treatment. But so many of the patients in these lists have been followed for several years and have continued well without any treatment whatever, doing their ordinary work, and sometimes very hard work, that this theoretical explanation of the results is absolutely untenable. Whatever the danger of operation may ultimately be shown to be, even if it should continue with a mortality of twelve per cent. or more, there can be no doubt that nearly all of the survivors will be cured of their symptoms, and it will probably be long before any internal treatment will be able to show such results in advanced cases of this most distressing disease.

¹ Loc. cit. ² *Mitth. a.d. Grenzgebiete*, 1902, ix. ³ Loc. cit. ⁴ *ANNALS OF SURGERY*, July, 1905, p. 33.

IMPACTION OF A TOY BICYCLE IN THE ŒSOPHAGUS; SUCCESSFUL REMOVAL BY ŒSOPHAGOTOMY.

BY HUGH M. RIGBY, M.S. (LOND.), F.R.C.S. (ENG.),

OF LONDON,

Assistant Surgeon to the London Hospital.

Most operating surgeons are called upon at one time or another to remove some quaint foreign body introduced into one of the various orifices of the human anatomy. Every test-book on Surgery contains records of such articles which had been safely extracted from the rectum, vagina, urethra, etc. The "Bust of Napoleon" unearthed from the rectum and the "Pomatum Pot" from the vagina are classical. The foreign body introduced in this case was a leaden model of the ordinary form of up-to-date safety bicycle.

In August, 1905, a little girl aged 4 was brought up to the London Hospital by her mother with the following history:—On the previous day the child had swallowed a small toy metal bicycle, which she was holding in her mouth. Since then she had had frequent attacks of severe retching and had been unable to take any food.

Shortly after her admission a radiograph of the thorax was taken and the bicycle was clearly shown.

It was evidently impacted in the œsophagus at the upper part of its thoracic course. (*Vide* radiograph 1.)

A bougie was passed down and an obstruction was met with some seven inches from the teeth.

An external examination of the neck was negative. An anæsthetic was administered and prolonged attempts at extraction were made by instruments passed through the mouth. Various forceps and coin-catchers were tried, without success.

On the next day the child was again anæsthetized and the thorax examined by an X-ray screen. The bicycle was seen to

be in its original position. The operation of œsophagotomy was then performed in the usual way.

When the œsophagus was opened it was found that the rim of the upper wheel could be easily seen just below the lower extremity of the wound in the œsophageal wall. The bicycle was extracted with some difficulty, as the handles were fixed in the wall of the œsophagus and these had to be cut off before removal could be accomplished.

The wound in the œsophagus was then closed by two rows of fine catgut sutures. The skin wound was partially closed and free drainage provided.

For three days after the operation there was some swelling of the neck and daily rise of temperature.

Discharge of saliva and some food contents came away through the wound during the first week, although feeding was carried out entirely through an œsophageal tube. This discharge ceased after a week and the drainage tube was dispensed with on the tenth day.

The further progress of the case was uneventful. The child left the hospital able to take ordinary food without any difficulty.

The accompanying photograph (2) was taken three weeks after the operation.

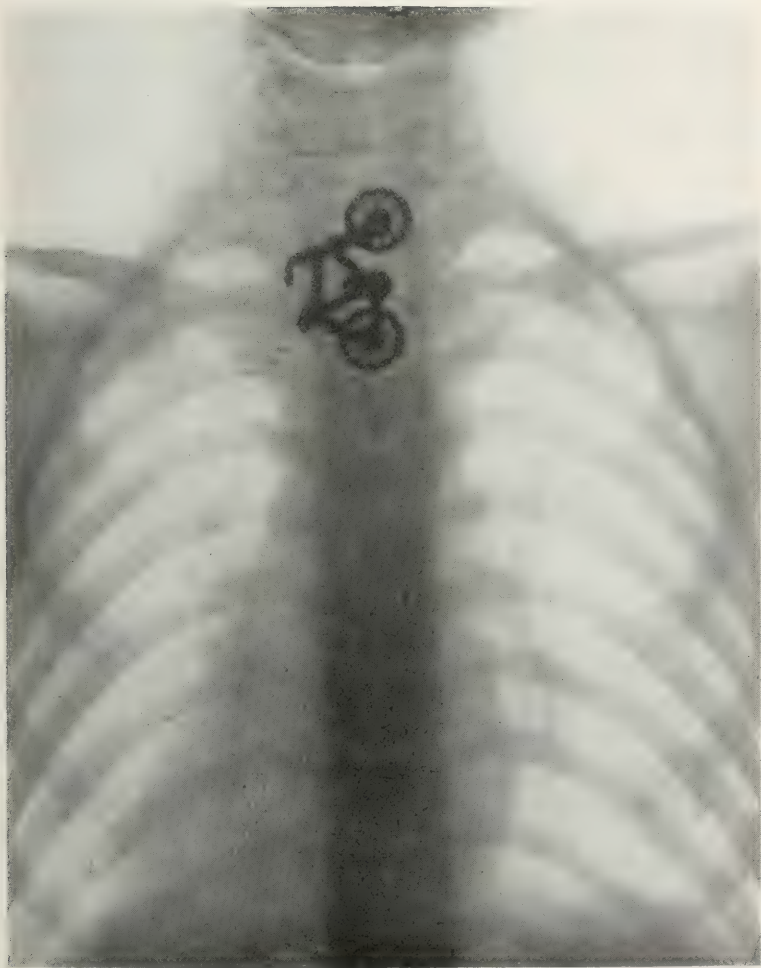


FIG. 1.



FIG. 2

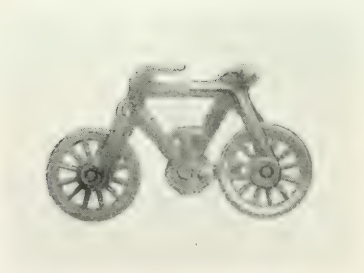


FIG. 3.

OVERLAPPING THE APONEUROSES IN THE CLOSURE OF WOUNDS OF THE ABDOMINAL WALL—INCLUDING UMBILICAL, VENTRAL AND INGUINAL HERNIÆ.

BY CHARLES P. NOBLE, M.D.,

OF PHILADELPHIA,

Surgeon-in-Chief, Kensington Hospital for Women; Gynecologist to the
Stetson Hospital.

My experience with the method of overlapping the aponeuroses in the closure of wounds of the abdominal wall has given such admirable results in the prevention of post-operative hernia that since 1896 I have been an enthusiastic advocate of this method of closure as applied to all wounds of the abdominal wall no matter what their location, provided drainage was not employed. As at the present time the use of this method of closure of abdominal wounds is becoming more general, it may prove of interest if I give the development of the method in my own practice and also in the hands of others.

An article by Dr. Kenelm Winslow appearing in the February, 1904, number of the *ANNALS OF SURGERY*, entitled "The Aponeuroses the Supporting Structures of the Abdominal Wall; their Approximation for the Prevention and Cure of Herniæ," has stimulated me to write this paper, although pressure of other duties has delayed its appearance. After discussing the employment of the principle of overlapping the aponeuroses in the cure of hernia, Winslow advocates, as a novel proposition, the adoption of the same principle as a routine procedure in the closure of ordinary celiotomy wounds, which theoretically he states should lead to improved results. This article shows that all general surgeons are not informed concerning the development of the operation of overlapping the aponeuroses in the closure of wounds of the abdominal wall and the results secured by it and indicates that an additional contribution to the subject may be of real value at this time.

Prior to May, 1892, I had employed the through-and-through silkworm-gut suture in the closure of celiotomy wounds. The high percentage of hernia following this method, especially in fat women, led me to abandon the method in favor of the tier suture. Following the principle of Schede of Hamburg¹ and Edebohls, I adopted the use of the buried permanent suture. Schede began the use of the buried silver-wire suture in May, 1887, more especially in the cure of large herniæ. The general surgical and the gynecological departments of the Johns Hopkins Hospital also had made extensive use of silver wire as a buried permanent suture. Edebohls² first employed silkworm-gut as a permanent buried suture in June, 1891, in the cure of a large umbilical hernia, and in May, 1892, he adopted the tier suture as a routine procedure, burying one row of silkworm-gut at the plane of the aponeurosis and then closing the skin and fat with a superficial row. I adopted Edebohls' technique and used it with but few changes until the end of 1896 for all wounds of the abdominal wall, including the Alexander operation, inguinal hernia and nephrorrhaphy. The changes consisted in substituting light for heavy silkworm-gut and in closing the subcutaneous fat and skin with catgut. The results secured by this method were eminently satisfactory as to primary wound healing, the prevention of hernia, and the absence of late irritation from the buried sutures, none of which gave trouble.^{3, 4}

In spite of this satisfactory experience, several considerations induced me to abandon the Edebohls technique and to devise the method of overlapping the aponeuroses as a routine operation. These considerations were: First, the advantages of closing the peritoneum with a running catgut suture; second, the advantages of a mattress suture in relieving tension; and third, that by special preparation of the aponeuroses and the overlapping of these structures a surface to surface union of the aponeuroses could be substituted for an edge to edge union, which promised to add materially to the strength of the resulting cicatrix. The advantages of the mattress suture and the overlapping of the aponeuroses first became apparent to me in operating for a large umbilical hernia in a stout woman April 7, 1894. Mattress sutures were intro-

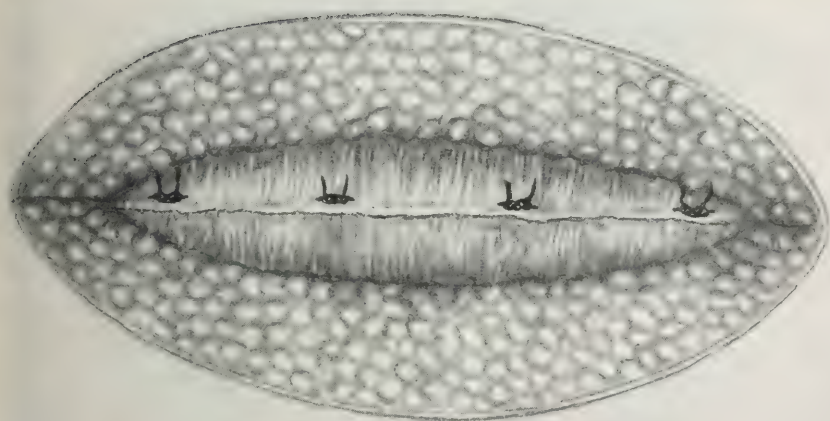
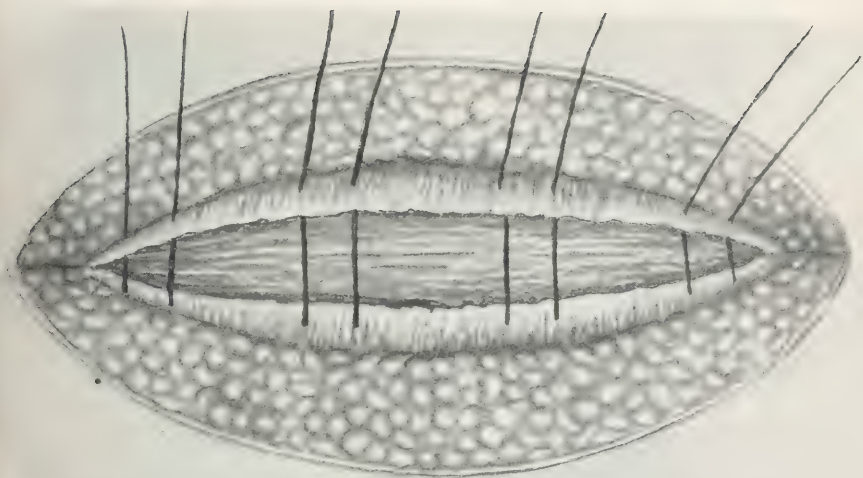


FIG. 1.—Modified mattress suture for closing the aponeurosis with silk worm gut.

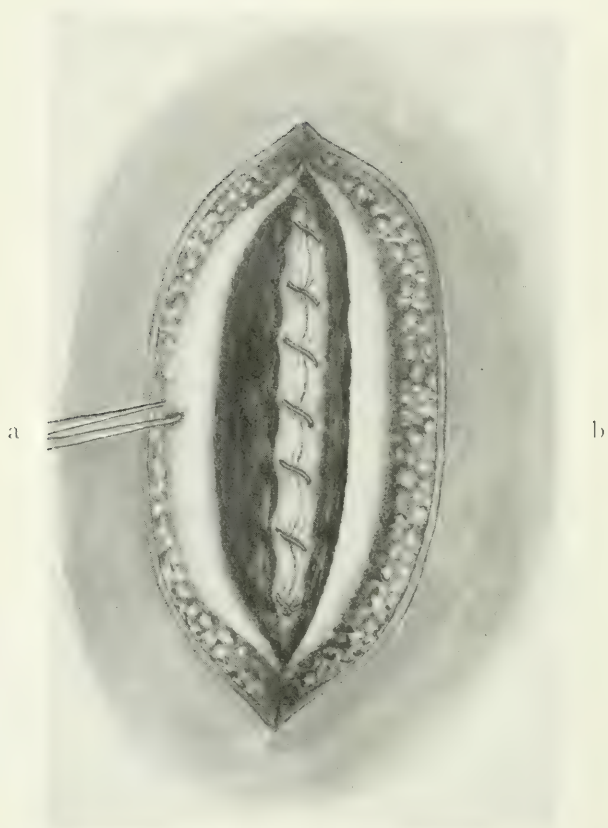


FIG. 2.—Closing the abdominal wound.—1. Suture of the peritoneum with a fine running cumol catgut suture; 2. Preparation of the aponeurosis for suturing. (a) Separation of the right aponeurosis from the rectus muscle. (b) Dissection of fat from the left aponeurosis.



FIG. 3.—Closure of the wound in the aponeuroses of the oblique muscles. Overlapping the aponeuroses by superimposing that of the right side of the wound upon that of the left, and suturing with a continuous chromicized catgut suture.



FIG. 4.—Suture of superficial fascia and fat layer.

duced primarily for the purpose of taking off tension from those introduced in accordance with the Edebohls technique, but it was evident to me that an additional advantage was gained in the extent of surface of the aponeuroses which was brought into apposition. The method was used occasionally from that date until it was adopted as a routine procedure at the end of 1896, especially in cases in which considerable tension was to be overcome.

It is now so generally accepted that the chief strength of the abdominal wall as a supporting structure depends upon the aponeuroses that we will not take time in demonstrating this proposition. It is equally accepted that the chief cause of post-operative ventral hernia is defective union of the aponeuroses, leading to separation of the edges of the aponeuroses and the development of hernia. The question which presented itself to my mind was whether an improvement could be made in securing aponeurotic union over that obtained by the methods in use in 1896. I had used the tier suture after the Edebohls technique with interrupted silkworm-gut suture, and was familiar with his later technique involving the use of the continuous catgut suture.⁵ It was clear to me that the aponeurotic union secured by these methods consisted in a scar of about one line in thickness between the divided edges of the aponeuroses, provided accurate union throughout the length of the wound was secured. It seemed to me that a much stronger union could be obtained by substituting a surface to surface union for an edge to edge union, therefore the method was devised⁴ and after various changes is now carried out as follows for celiotomy wounds:

The incision in the hypogastrium for operations on the female pelvic organs may be taken as the type. This incision is made by choice through the inner border of the right rectus muscle. In closing the wound the peritoneum is first closed with a continuous suture of fine cumol catgut. The fat is then dissected from the upper surface of the aponeurosis of the transverse muscles on the left side of the wound from one-third to one-half inch. The aponeurosis upon the right side of the wound is then separated for an equal distance from the rectus muscle. The muscles and fasciæ are then sutured

by means of a medium weight chromicized catgut suture in the following manner: The suturing is begun at the lower angle of the wound upon the left side. The suture is passed from above downward through the aponeurosis and rectus muscle. Then the separated bundles of the rectus muscle are united with a continuous suture until the upper angle of the wound is reached, when the suture is passed from below upward through the aponeurosis upon the left side of the wound. The suture is then passed from below upward through the aponeurosis upon the right side of the wound, and an additional suture is taken above this point to fix the suture and take the strain off that part which has brought the muscle in apposition. The aponeurosis is then closed from above downward by catching the aponeurosis from the left side of the wound after the manner of the Lembert intestinal suture, and then passing the needle from below upward through the aponeurosis upon the right side of the wound. When this suture is drawn taut, it slides the aponeurosis of the right side of the wound upon the aponeurosis on the left side of the wound. The process is repeated until the lower angle is reached, when the two ends of the suture are tied. In long wounds two or more mattress sutures are placed to take tension off the lines of continuous suture. The fat is closed with a continuous suture of fine cumol catgut. The skin is closed with fine cumol catgut suture by the intracuticular method. When median wounds are long, extending near or above the umbilicus, care is taken to unite the posterior aponeurotic sheath of the rectus muscle with the peritoneum.⁶

The method was at once used for all wounds of the abdominal wall, including herniotomy wounds, modifying slightly the operation in accordance with the anatomical conditions to be dealt with. In the beginning mattress sutures of silkworm-gut were used to close the aponeurosis. Since introducing the method, I have used it constantly, modifying the details somewhat, but never the principle involved.

In 1898 silkworm-gut mattress sutures were abandoned and a continuous chromicized catgut suture for the rectus muscle and for the aponeuroses was substituted.⁷ With the adoption of catgut it became feasible to make some further

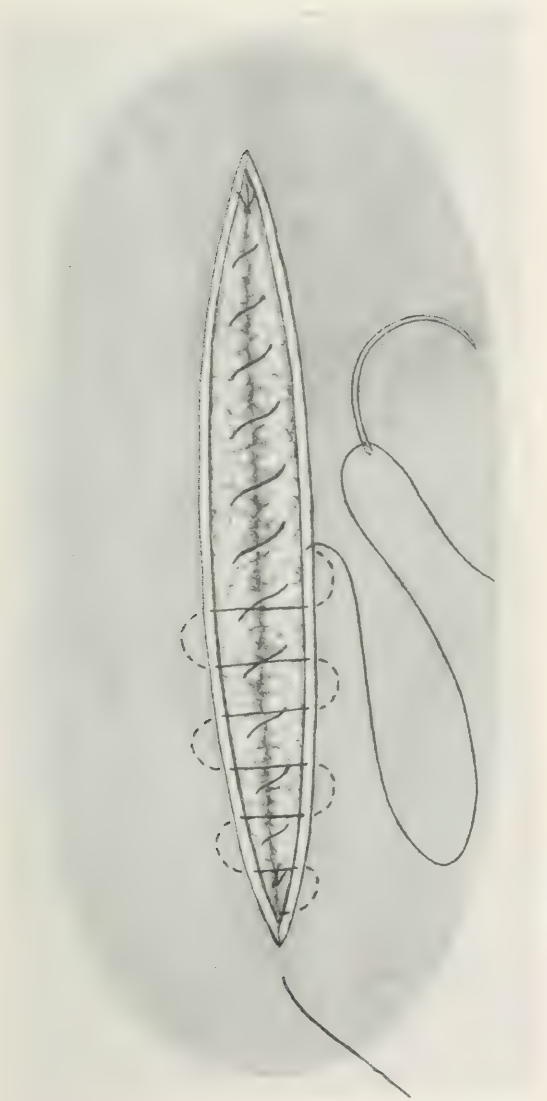


FIG. 5.—The subcuticular suture of the skin.

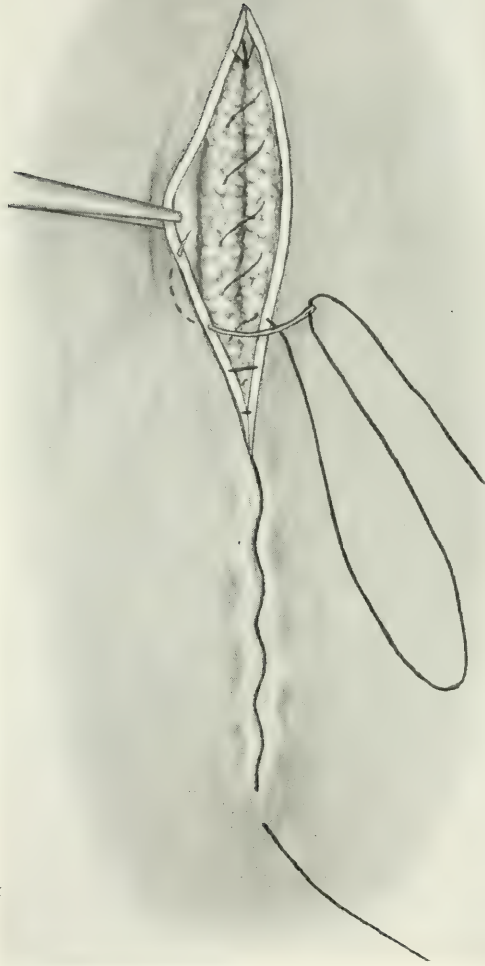


FIG. 6.—Skin wound partly closed by subcuticular suture.

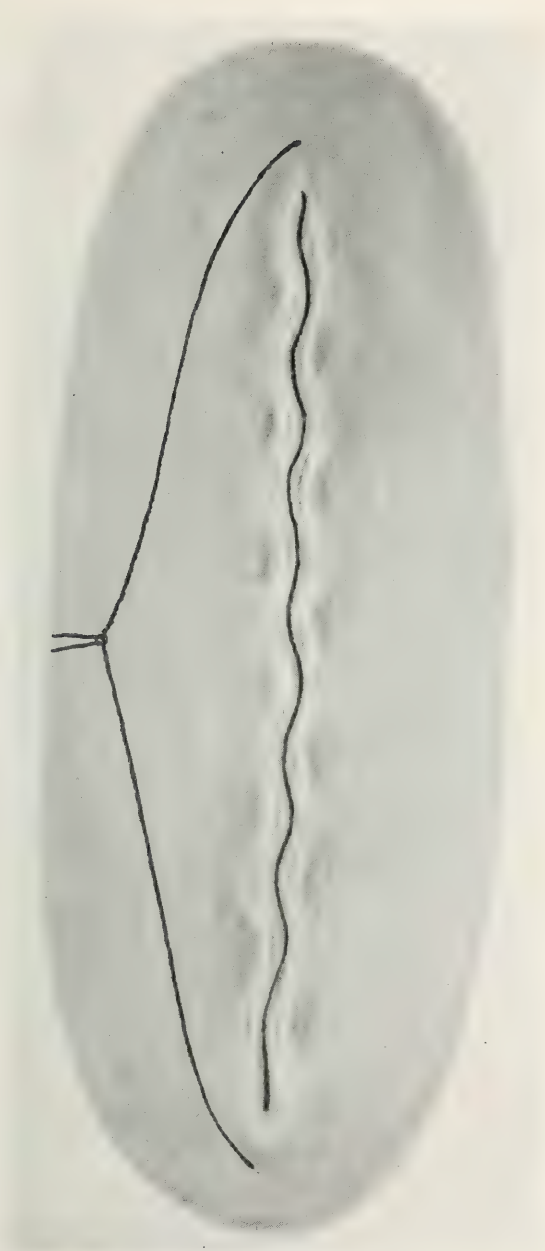


FIG. 7.—Final closure of skin wound.

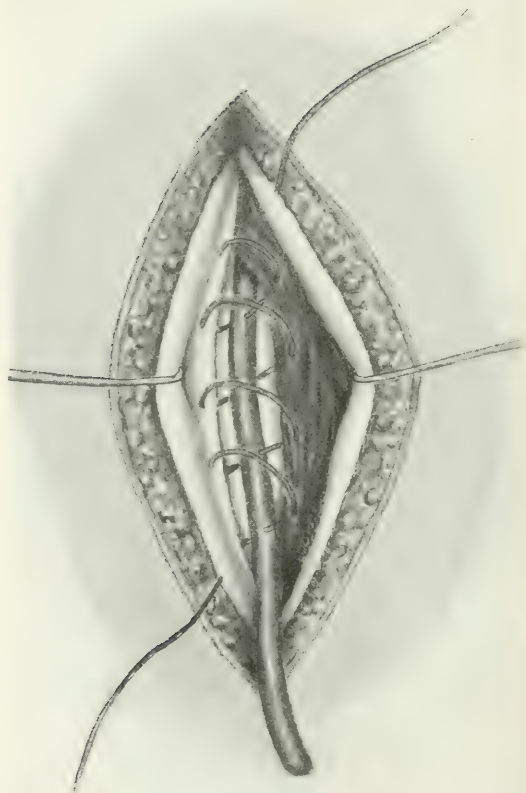


FIG. 8.—Shortening the round ligaments. Suturing the internal oblique round ligament and Poupart's ligament with chromicized catgut, to fasten the ligament and obliterate the canal.

improvements in the method. Care was taken to suture the posterior sheath of the rectus muscle together with the peritoneum when the median incision was high enough to divide that structure. In operating for appendicitis the incision through the outer border of the rectus muscle was adopted, and a fine chromicized catgut suture was employed to close the posterior sheath of the rectus together with the peritoneum. In this way not only the anterior but the posterior aponeuroses were carefully united. The same method of suturing was employed for inguinal hernia and for Alexander operations.^{8, 9}

Having traced the development of the method of overlapping the aponeuroses in its general aspects, a reference to some of its special applications is in order. My original paper, "A New Method of Suturing the Abdominal Wall in Celiotomy" (1897), opens with the following paragraph:

"I desire to report a new method of closing the wound in celiotomy, which I believe will give good results in all cases, and will enable the surgeon to deal successfully with cases of diastasis of the recti muscles, which heretofore have been most difficult to cure."

Since that time the method had been employed repeatedly for the cure of diastasis of the recti, and so far as is known in no case has there been a recurrence or the development of a ventral hernia. I am satisfied that the method by overlapping the aponeuroses will give better results than that proposed by Webster in 1900.¹⁰

In the cure of herniæ the method of overlapping the aponeuroses is especially important and valuable. As already stated, it was first employed by myself in the closure of an umbilical hernia in 1894. Since that time the method has been employed in almost all operations for hernia, whether umbilical, ventral or inguinal. In operations for umbilical hernia at times there is less tension when the aponeurosis is overlapped from above downward instead of from side to side. If good surface-to-surface aponeurotic union can be secured, a permanent cure will be effected even though the recti muscles remain separated. I first made use of the plan of overlapping

the aponeuroses from above downward February 14, 1898. In this case it was impossible to approximate the recti, and as there was far less tension from above downward than laterally the transverse suture was adopted. This method of operating upon umbilical hernia has been largely employed by W. J. Mayo, who first reported upon its use in 1898.¹¹ In this paper, after describing the method of overlapping which he had employed, he states that it was similar to my method of closing celiotomy incisions. Since that time Mayo has made two further reports upon the cure of umbilical hernia by overlapping the fasciæ, and has especially recommended the overlapping from above downward.^{12, 13}

The principle of overlapping the aponeurosis in the cure of inguinal hernia was first applied by Lucas-Championnière in 1892 or earlier.¹⁴ In 1901, in his brochure on the radical cure of inguinal hernia,¹⁵ he reported a series of seven hundred and fifty-nine operations. It is not necessary in this connection to discuss the methods used by Championnière in dealing with the sac and the inguinal canal itself. The question of particular interest is his method of dealing with the aponeurosis. He devised what he calls a U-shaped suture, which is a modified mattress suture, by means of which he overlapped the outer segment of the aponeurosis upon the inner segment, and then by means of interrupted sutures made the approximation neat. I can find no indication that Championnière employed the principle of overlapping the aponeuroses otherwise than in the cure of inguinal hernia, and must therefore conclude that he failed to appreciate its value in the closure of celiotomy wounds in general. The method of suturing which he used accomplishes the overlapping of the aponeurosis very satisfactorily, but it is much more complicated and more tedious in its application than the method which I have devised.

E. Wyllys Andrews was the next surgeon to make use of the principle of overlapping the aponeurosis in the cure of inguinal hernia. He called the method which he devised the "imbrication or lap joint method."¹⁶ He refers to the work of Championnière, which he regards merely as an improvement on the usual method of closing the inguinal canal. His own operation accomplishes two purposes; first, the overlapping

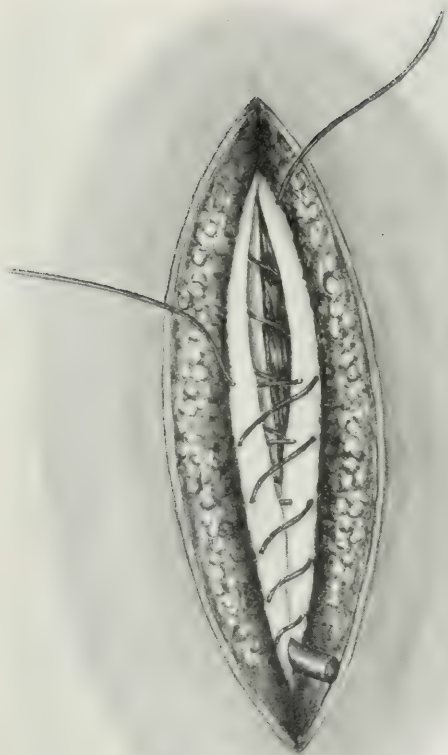


FIG. 9.—Overlapping the aponeurosis of the external oblique in closing the inguinal canal.



FIG. 10.—Championnière's method of overlapping the aponeurosis of the external oblique—inguinal hernia. Showing U-sutures, and interrupted sutures in place.

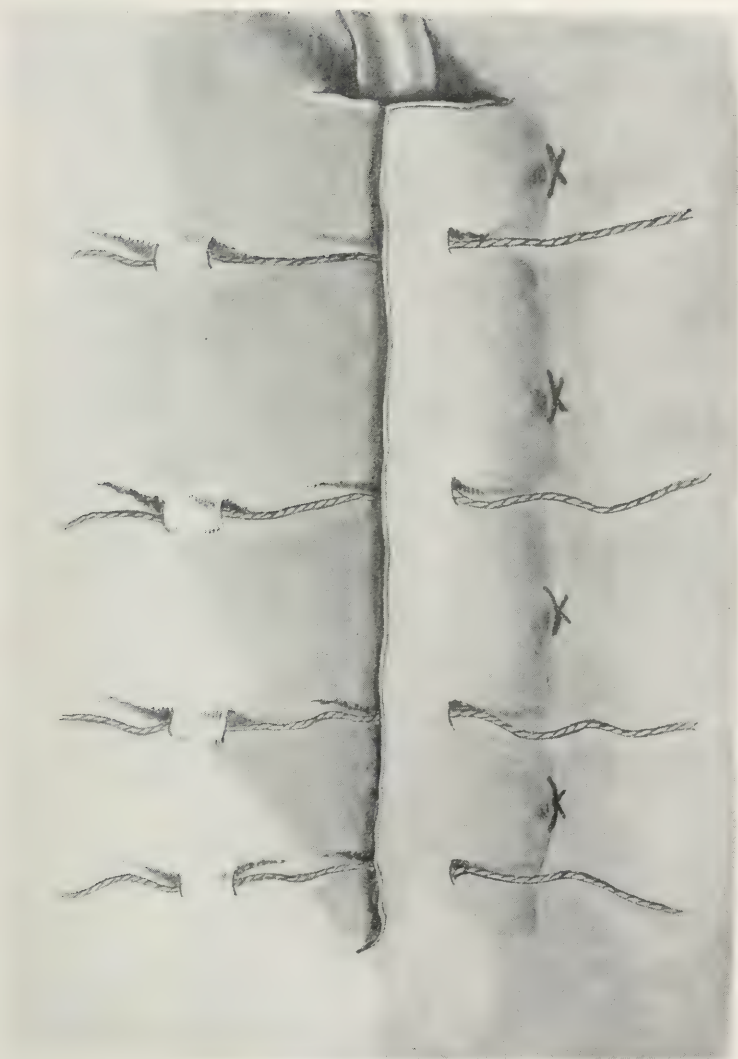


FIG. 11.—Championnière's method—showing the U-sutures tied, and the interrupted sutures in place for tying.

of the aponeurosis; and second, the transplantation of the cord into an artificial canal. He sutures the inner layer of the aponeurosis to Poupart's ligament behind the cord. The outer layer of the aponeurosis is then sutured above the cord to the inner layer. From the standpoint of the more general use of the principle of overlapping the aponeuroses, Andrews' article is of special interest, as he states that "the principle of imbrication or overlapping the several aponeurotic layers of the abdominal wall may enter into other abdominal operations to advantage, as I have repeatedly shown." In a second article on the radical cure of hernia,¹⁷ in 1897, after discussing his own and other methods for the cure of inguinal hernia, he concludes with the following:

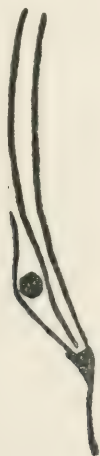


FIG. 12.—Andrews' imbrication or lap-joint operation for inguinal hernia.

"I can not refrain from stating that I have found the principle of imbrication applicable to other purposes such as uniting abdominal wounds after ordinary celiotomy near the linea alba and linea semilunaris; but in this part of the subject I cannot hope to interest you at the present time."

It is thus evident that Andrews appreciated the value of the principle in suturing all wounds of the abdominal wall, and therefore it is probable that he made more or less systematic use of it.

If this paper were a study of the development of the radical cure of inguinal hernia, it would be necessary to refer to the operations of Bassini, Halsted and others, but with its actual limitations it is only of interest to point out that in the Johns Hopkins clinic practical experience showed the limitations of the original Halsted operation with the typical mattress suture. Bloodgood tried to meet the necessities of the case in large herniæ by transplantation of the rectus muscle and by use of the sheath of the muscle to take the place of the conjoined tendon.¹⁸ Halsted¹⁹ still later reports that in certain cases he makes a flap from the cremaster muscle, which is sutured to the under side of the internal oblique muscle. The conjoined tendon and the internal oblique are sutured to Poupart's ligament, and then the aponeurosis of the external oblique is overlapped. Halsted states that this is known as the Andrews method, although devised independently by him.

My own work in the cure of inguinal hernia has been incidental to that in abdominal surgery in general and gynecology, and I have never devoted special study to the closure of wounds of the inguinal canal, whether for inguinal hernia or the Alexander operation. In operations for inguinal hernia in women the Bassini operation has been done, with overlapping of the aponeurosis of the external oblique. In the Alexander operation the same technique has been followed, with the exception that the round ligament has been included in the sutures which unite the internal oblique to Poupart's ligament. In addition, I frequently place a mattress suture of silkworm-gut at the internal ring in hernia operations to reinforce this point—the suture entering the external oblique, passing through the internal oblique, through Poupart's ligament, and then back through the internal and external oblique. This suture is tied after the canal is closed in the usual way.

In my own work the development of the principle of overlapping the aponeuroses in the closure of wounds of the abdominal wall grew out of my experience with the other methods of closure previously used, and was the natural consequence of recognizing the shortcomings of these methods. The application of the principle to the cure of inguinal hernia, to the cure of umbilical hernia, and to the cure of diastasis of

the recti muscles, was a natural development from the use of the principle in the usual celiotomy wound, and for operations for appendicitis and for movable kidney. I was not aware of the work of Championnière and Andrews in the cure of hernia, as not being a general surgeon and having no occasion to operate for inguinal hernia in men, I had given no critical study to the special literature concerning inguinal hernia.

It is quite clear that to Championnière is due the credit of having first appreciated the advantages of overlapping the aponeuroses; apparently, however, he did not realize that the principle had any application elsewhere than in the inguinal canal. With Championnière's work as a basis, Andrews developed a special technique for the cure of inguinal hernia, and also more fully appreciated the importance of the principle, as shown by the references already given to his articles, in which he claims that the method can be applied with advantage to the usual celiotomy wounds. It is evident that the process by which Andrews arrived at this opinion was exactly the reverse of my own experience. A realization of the advantages of the method in the special operation for the cure of inguinal hernia suggested its employment in all other abdominal wounds; whereas, in my own work the appreciation of the advantages of the method in the closure of abdominal wounds in general led to its employment in the special operations on the inguinal canal.

The best evidence which I can give as to the practical merit of the method in the prevention of post-operative hernia is the fact that during the nine years in which the method has been in use, but a single patient has presented herself with post-operative hernia. Others may have occurred of which I have no knowledge, but it is quite clear that post-operative hernia plays an unimportant rôle when the aponeuroses are overlapped in the closure of celiotomy wounds.

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FOREIGN-BODY PSEUDO-TUBERCULOSIS OF THE PERITONEUM.

BY CHARLES MINER COOPER, M.B., M.R.C.S.,
OF SAN FRANCISCO, CALIF.,

Adjunct Visiting Physician to the German Hospital.

PSEUDO-TUBERCULOSIS, a term coined by Eberth in 1885, has widened in its application so as to include under its designation all conditions which anatomically resemble genuine tuberculosis, whatever their etiology.

Ophüls, in a valuable survey of this subject in the Reference Handbook of Medical Sciences, Vol. VI, page 778, adopts the following etiological classification:

1. Pseudo-tuberculosis caused by the bacillus Pseudo-tuberculosis Rodentium. Two not altogether convincing instances of human infection are reported in this connection.

2. Pseudo-tuberculosis caused by a bacillus resembling the bacillus of Pseudo-tuberculosis Rodentium. Du Cazal reports two such cases, in one of which nodules the size of a hazelnut were found on the surface of the peritoneum, in the pancreas and liver. Wrede records another instance of such infection in which miliary nodules were found on the peritoneum, as well as in other localities. The causal bacillus possessed acid fast staining properties.

3. Pseudo-tuberculosis caused by other bacilli, as, *e.g.*, bacilli resembling the Diphtheria bacillus.

4. Pseudo-tuberculosis caused by filamentous bacteria. Eppinger records a case of brain abscess. Flexner, under the designation of Pseudo-tuberculosis Hominis, reports an instance in which tubercular-looking lesions were found in the lungs and tubercle-like nodules in the peritoneum. A streptothrix was apparently the pathogenic germ.

5. Pseudo-tuberculosis caused by mould fungi, *e.g.*, pigeons' pseudo-tuberculosis due to the aspergillus mould. Several instances of human mould infection are on record.

6. Pseudo-tuberculosis produced by the organism of *Blastomycetes Dermatitidis*.

7. Pseudo-tuberculosis produced by the fungus *coccidioides*. Here the combination of the miliary abscess and miliary tubercles may be very bewildering, as Ophüls has pointed out.

8. Pseudo-tuberculosis caused by animal parasites and their eggs.

9. Pseudo-tuberculosis produced by dead foreign bodies.

The first seven varieties are mainly of interest to the physician, and are becoming clinically more important, since the list of reported cases of lung disease is constantly lengthening, in which symptoms and physical signs suggestive of tuberculosis may occur, together with acid fast bacilli in the sputum, and yet the ailment be non-tubercular in origin. Some of these cases, however, are only clinically pseudo-tubercular, the underlying pathologic lesion not resembling genuine tuberculosis. From what has been said, it will be seen that if the peritoneum be involved in these varieties, it occurs in association with similar lesions elsewhere, and serious errors in intra-abdominal operative work are not apt to occur. The last two varieties, however, possess a special significance for the surgeon, as the following cases will show:

Helbing, in the *Berl. klin. Wochenschr.* 1899, page 714, records as follows: A laparotomy was performed for perityphlitis. Tubercles were seen on the omentum and cæcum. A piece of omentum was removed. With the endeavor to demonstrate the tubercle bacillus, sections were made and suitably stained. In place of the bacillus, the eggs of the tania worm were found occupying the center of the nodules lying among the giant cells. Helbing ascribes the lesions to the escape of these eggs from a perforated appendix, they acting as chronic localized peritoneal irritants. He credits Miura, of Tokio, with a similar observation, but omits the reference.

Carl Meyer, in the *Beitr. z. Pathol. Anat. u. Allegem. Pathol.* xiii, 1, 1903, reports a case of a woman who had had an abdominal tumor for some years. A few weeks previous to her entrance to the hospital it had evidently ruptured. There was now free fluid in the peritoneal sac. Examination of the aspirated fluid showed cholesterin crystals and red blood cells. Laparotomy demonstrated an ovarian cyst, many peritoneal miliary tubercles, and in their neighborhood fibrinous masses. Macroscopic examination of tissue removed resulted in the diagnosis of a

dermoid ovarian cyst and tubercular peritonitis. Microscopic investigation, however, revealed the true nature of these little bodies; they were pseudo-tubercles. In their center were giant cells, and amongst the giant cells, and in some instances enclosed in these cells, were cholesterol crystals. The diagnosis was then changed and naturally—an all important point for the patient—the prognosis. Meyer then refers to several instances of pseudo-tuberculosis of the conjunctiva and iris due to the irritation and enclosure of little hairs, and to experiments showing the formation of giant cells around wound ligatures. He records two other extremely interesting cases.

The first (Von Recklinghausen) concerns a woman who died from pneumonia several months after being laparotomized. A disseminated tuberculosis of the abdomen was found. Microscopic examination of the tubercles, however, showed that it was another instance of foreign-body pseudo-tuberculosis, little pieces of sponge left behind in the abdomen at the time of the operation being found within the nodules.

In the second case, first reported by Hanau in the *Correspondenzblatt für Schweizer Aerzte Jahrbuch*, xxi, a man who had had typical symptoms suggestive of gastric ulceration for upwards of five years, was seized twelve days previous to his death with epigastric pain, accompanied by fever. Postmortem revealed a large ulcer saddling the lesser curvature and this had perforated; in the adhesions round about and in the neighboring peritoneum were numerous miliary tubercles. Though the ulcer looked to be of a simple nature, it was suspected to be carcinomatous, these little nodules being regarded as possibly metastatic, more particularly as there was no possible primary tubercular focus except a partially calcified bronchial gland. Microscopic examination demonstrated that the little bodies were pseudo-tubercles and that amongst the giant cells were enclosed little remnants of vegetable food. The ulcer was non-malignant in character.

Dévé (*Revue de Chirurgie*, July, 1902, page 67), in an article entitled “Des Cholérages Internes,” collates thirteen instances of “Cholépéritoine Hydatique.” Amongst these thirteen are four in which pseudo-tuberculosis of the peritoneum had occurred. The causal irritants were the hydatid hooklets or small pieces of hydatid membrane. In one case (De Quervains, reported in the *Centrabl. f. Chir.* 1897, No. 1), much difficulty in diagnosis resulted, even though the ascitic fluid was bile-stained. In another case (Debove and Soupault, *Soc. méd. des. hôp.*, 9th Dec., 1902, et 19th October, 1894), an actual error was made and the abdomen closed in consequence. Dévé’s description of these tubercles is so clear that I quote him in full. He says:

These pseudo-tubercles are commonly of the size of a pin-head or millet-seed; they are whitish or translucent. Macroscopically they are often indistinguishable from genuine miliary tubercles, and appear as though modelled after these lesions. They may occur over the parietal or visceral peritoneum or in the omenta. They are covered by the peritoneal endothelium and appear as though embedded in the subendothelial peritoneal cellular tissue. By introducing under them the taut finger they are rendered more salient. Microscopically, they may resemble miliary tubercles even down to the finest histological detail. Many multinucleated giant cells are present in the centre of these newly-formed little nodules. The giant cells are surrounded in their turn by a mixed layer of epithelioid and round cells. But characteristic or pathognomonic of these pseudo-tubercles are the causal irritants which are found lying amongst the giant cells. In the cases collated by D  v   pieces of laminated hydatid cyst membrane, or the characteristic hooklets, were thus included. Calcification even may take place in some of the nodules. He draws particular attention to these bodies and notes the absence of all allusion to them in French books, and the liability of the surgeon to diagnostic error. He believes their formation to be a protective process and remarks that they may occur on other serous membranes than the peritoneum. Thus he quotes Lehne who recorded a similar pseudo-tuberculosis of the medullary meninges occasioned by the rupture of an hydatid cyst of the spinal column. He further adds that not all the little bodies found in the cases he records were of the nature described above, some being the early stage of secondary hydatid cyst development.

The non-tubercular origin of these little structures is convincingly established, for tubercle bacilli can neither be demonstrated in section, by culture, or by guinea-pig inoculation; and, moreover, the characteristic lesions can be, and frequently have been, produced experimentally by the injection of tubercle free foreign bodies. Thus, Wallenburg produced such lung pseudo-tubercles by intra-tracheal injection of droplets of metallic mercury. D  v   produced them in rabbits by the injection of hydatid scolices, etc.

I have not been able to find any record of similar cases in English or American literature, but in Rolleston's "Diseases of the Liver, Etc.," in the discussion of the results of intra-peritoneal rupture of liver hydatid cysts, brief mention is made of these pseudo-tubercles, and D  v  's article referred to, whilst in Herman's "Diseases of Women," page 776, the following pregnant paragraph is to be found: "The question has been raised but never settled, as to those cases in which the

peritoneum is studded with little bodies looking and feeling like miliary tubercles,—whether these bodies are really the product of the tubercle bacillus? In the cases that recovered there is no evidence for or against.”

The following history is of interest:

A. B., a middle-aged plump woman was admitted into the German Hospital under the care of Dr. Jellinek, to whom I owe the privilege of seeing the patient and reporting the case. She was a feckless individual and gave a very unsatisfactory history. We eventually learned that she had been seriously ill for six weeks, and that her illness had begun acutely with pain in the lower abdomen, which she insisted upon ascribing to coition vaginal injury. There was no temperature; the face was pale; the pulse quick and feeble; there was marked aversion to food, but no vomiting, and no obstruction symptoms. Her bowels were reported to have moved the day previous. The lungs were normal. The heart sounds were feeble, but no murmur was audible. Examination of the nervous system was negative. The abdomen was well clothed with fat, was somewhat distended, and over the right ovarian region a linear scar was present. There was no rigidity of the abdominal wall, but some tenderness was evident on slight pressure over the bladder region. The liver and spleen were not palpable. The percussion note was dull, and free fluid was present in the peritoneal cavity. Posteriorly, there was dullness to percussion up along the ascending colon, and a slight filling out of this area when compared with the corresponding region of the opposite side. Vaginal examination revealed some thickening of the left tubo-ovarian structures. Rectal examination was negative. The urine, small in amount, gave a Diazo reaction, but was otherwise normal. The leucocytes numbered 12,000 per c.m., 70 per cent. being of the polynuclear variety.

In view of the acute onset, her clinical aspect, the leucocytosis, and the post colonic dullness, I believed her to be suffering from a sub-acute infective peritonitis with a localized post-colonic collection of pus, due to a diseased tube or appendix, rather than from a tubercular peritonitis, which appealed to us as the most likely alternative diagnosis. She was referred to the

surgical side and her abdomen opened. A large quantity of brownish serous fluid was evacuated. The intestines and peritoneum that presented were seen to be covered with innumerable miliary tubercles, though (and we would emphasize the point) no matted fibrous bands or enlarged glands were evident. A diagnosis of tubercular peritonitis was made, the abdomen emptied of fluid as far as possible and then closed. The patient continued to weaken and shortly died. Even after the operation I could not correlate her appearance and the clinical findings with an uncomplicated tubercular peritonitis, and so sent her to the postmortem room with a diagnosis of tubercular peritonitis as discovered at operation, plus a peritoneal infection. At the autopsy, made by Dr. Ophüls, the small miliary tubercles were much in evidence, being present over the general peritoneum. The intestines were somewhat matted together by recent fibrinous adhesions. There were no old fibrous bands and no abdominal glandular enlargement. The appendix was normal and there was no pelvic infection. The post colonic dullness was due to a localized collection of pus. Examination of the stomach showed a large perforated gastric ulcer saddling the lesser curvature and small carcinomatous nodules were present in the liver, which, however, was not enlarged and was well up under the rib margin.

The macroscopic examination thus revealed:

1. Subacute septic peritonitis secondary to a perforation of a gastric ulcer as the immediate cause of death.
2. Small carcinomatous nodules in the liver.
3. Small miliary tubercles in the peritoneum which, from their naked-eye appearance, might be: (1) Miliary tubercles; (2) miliary carcinomata; (3) pseudo-tubercles. No primary tubercular focus was present. They were thus probably either carcinomatous or pseudo-tubercular.

Microscopic examination by Dr. Ophüls, to whom I am much indebted for the report, demonstrated that the gastric ulcer was carcinomatous in nature and that the peritoneal nodules were pseudo-tubercles containing no bacilli, but showing in their interior little food particles, which were surrounded by giant cells, they thus corresponding to the pseudo-tubercles found in Hanau's patient.

The record of this patient is extremely instructive, inasmuch as the history (true an imperfect one) did not suggest any ailment of the stomach. Moreover, all symptoms were referred to the lower abdomen, and the few clinical signs present pointed to a lesion in that vicinity. Looking back, I believe that in the absence of a reliable history my original diagnosis should have read, "Sub-acute septic peritonitis plus a retro-colonic abscess—origin uncertain," thus leaving the further elucidation to the operating surgeon. I had seen, some years previously, a patient in whom a tentative diagnosis of tubercular peritonitis had been made. Sudden collapse took place and death ensued. The autopsy showed a gastric ulcer which had evidently perforated, had been occluded by the omentum and then re-perforated, causing the fatal collapse. In that patient there were, similarly, no symptoms or signs referable to the stomach, but then the ulcer was occluded till just a few hours previous to death. In this case, however, the perforation was a large one and there was no indication of any such occlusion.

From this case history and the history of the collated instances of pseudo-tuberculosis, we learn that exploration of the abdomen should be thorough, and that a too hasty operative diagnosis of tubercular peritonitis is to be avoided, more particularly if old fibrous bands or enlarged intra-abdominal glands be absent, otherwise avoidable fatalities may result. If the ascitic fluid be bile-stained, echinococcic pseudo-tuberculosis will be thought of; on the other hand, if fibrinous or pseudo-myxomatous masses are found in the abdominal cavity a ruptured ovarian cyst will be looked for, but though no free-food particles be recognizable as in the reported case, gastric perforation of some little standing cannot be definitely ruled out without an exploration of the upper abdomen. They further serve to once again draw our attention to a fact long recognized by pathologists, viz., that the demonstration of the tubercle bacillus by staining, culture or inoculation, is the only sure proof of its being a causal agent in the production of any lesion, however much that lesion may anatomically resemble genuine tuberculosis.

SOLID TUMORS OF THE MESENTERY WITH REPORT OF A CASE AND A REVIEW OF THE LITERATURE.

BY JAMES VANCE, M.D.,

OF EL PASO, TEXAS,

Recently Professor of Bacteriology and Assistant to the Chair of Abdominal Surgery, Hospital College of Medicine, Louisville, Kentucky; Visiting Surgeon to the Louisville City Hospital.

ALTHOUGH within recent years a good many cases of solid tumors of the mesentery have been reported the condition is still sufficiently rare to attract the attention of medical men.

Mesenteric tumors were described as early as 1803 by Portal, and classified by him as scirrhus, steatomatous, stony, cancerous and hydatid. He describes the diagnostic features clinically and points out the difficulty of differentiating between mesenteric and omental tumors. His work attracted very little attention, most probably because it was post-mortem. We hear nothing more of mesenteric tumors till 1880, when Tillaux reported a case of *cyst* of the mesentery successfully removed. In the same year Péan reported three such cases operated on by him, giving the diagnosis and treatment. In the next few years numerous cases of cysts were reported, but reports of solid tumors were exceedingly rare. So rare was this condition of solid tumors of the mesentery that Mr. Lockwood states that no such tumor had been exhibited to either the London Pathological or Medical Society prior to 1895. In 1897 Mr. Shield reported a case to the Medical and Chirurgical Society of London, at which time the subject was quite unfamiliar to that society. Douglas read a paper on this subject before the Southern Surgical and Gynecological Society in 1898, and no surgeon present had had any operative experience with these tumors.

Lipomata are said to be the most frequently found solid tumors, and these sometimes attain enormous size. Von Bergmann reports that Terillon removed one weighing 29 kg.

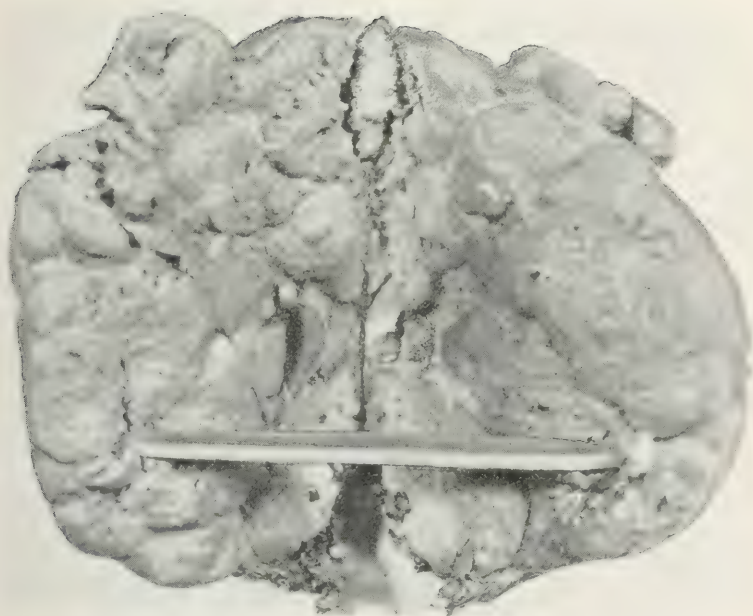


FIG. 1.—Gross appearance of tumor of mesentery.

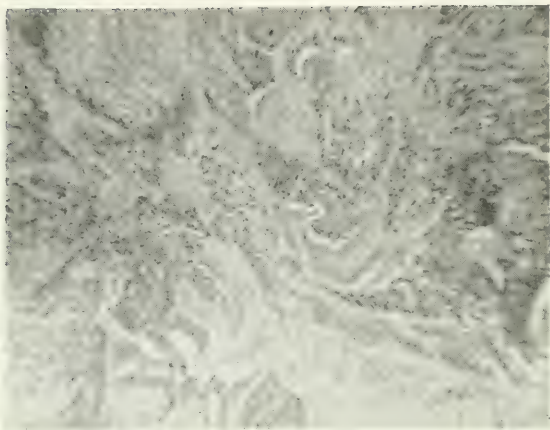


FIG. 2.—Sarcoma of mesentery. Photo-micrograph, magnified 50 diameters.

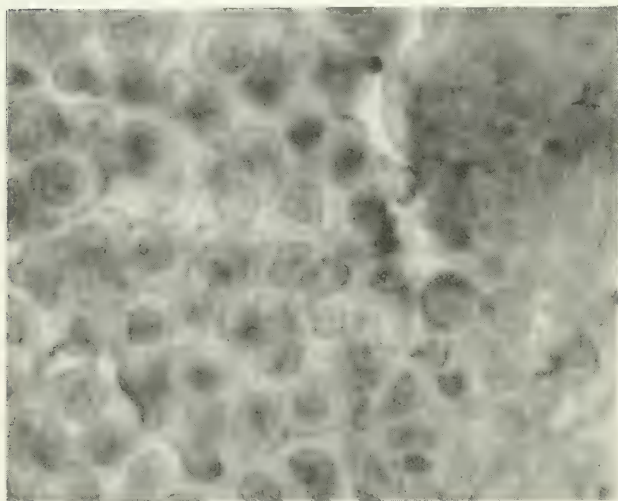


FIG. 3.—Sarcoma of mesentery. Photo-micrograph, magnified 425 diameters.

(64 lbs.). Van der Veer had one of 28 kg. and Péan another of 28 kg. Waldeyer describes a lipomatous myxoma with metastases in the lungs and other organs, weighing 61 lbs. Other primary tumors of the mesentery are fibroma, myxoma, enchondroma, teratoma, sarcoma, and adenoma; also mixed growths as fibro-lipoma, fibro-myxoma, fibro-myo-sarcoma, and lymphadenomata. Carcinoma is said never to be primary but always secondary, as a metastasis to a primary lesion elsewhere. This seems disproved by the case of primary carcinoma of the mesentery reported by Wanless in 1903 (see Case 22 of Table I).

The seat of these tumors is usually in the mesentery of the small intestine, but there are now several cases reported as seated in the mesocolon and sigmoid flexure. As new cases are reported the formerly restricted lines of origin and kinds of growth are widened till it now bids fair to include all mesentery as field of origin and nearly all kinds of tumors as the bounds of the new growths. The embryologic development of the mesentery makes this prediction likely if the embryonal theory of the origin of tumors amounts to anything.

TABLE I.—SOLID TUMORS OF THE MESENTERY.

Case.	Reporter.	Sex.	Age.	Growth.	Previous History.	Operation.	Attachment.	Resection.	Post-Operative History.
1	Dallmann. Inaug. Dissert. Halle, 1903.	M.	40	Numerous nodular fibroid masses.	Constipation, bowels moving only by enemata. Headache and intestinal indigestion. Symptoms for 5 months.	Incision from xiphoid to symphysis. Large tumor removed with difficulty from mesentery alongside of vertebral column. Drain and tamponade.	Mesocolon and mesentery.	None.	Dismissed from hospital as cured on 20th day.
2	Gildemeister. Inaug. Dissert. Breslau, 1902.	F.	22	Fibroma with points of calcareous degeneration.	Obstipation, with vomiting, which became fecal three days prior to operation.	Median incision and small tumor removed from front of vertebral column between folds of mesentery.	By pedicle to mesentery.	None.	Recovery in 20 days.
3	"	F.	30	Spindle-celled sarcoma.	Pain and swelling in right side of abdomen. Other symptoms negative.	First Operation—Omentum adherent to tumor, which on separation opened an abscess from behind tumor. Drainage. Second Operation—Removal of entire growth.	To mesentery with many adhesions.	None.	First Operation—Fus drained for several days. Second Operation—Followed by complete recovery. Some months between the operations.
4	"	F.	8	Angio-sarcoma morphology of numerous semicircular dark red nodular masses.	Taken suddenly ill 8 days previous to operation with pain in abdomen. No vomiting or constipation.	Tumor removed with adherent bowel. No connection to reproductive organs.	Connected with mesentery but no adherent except to bowel.	9 cm. of healthy bowel.	Death on 9th day from exhaustion.
5	"	F.	38	Fibroma.	Premature birth one year ago, since which she noticed a movable tumor in the abdomen. Pain, constipation and dyspnoea; 3 months pregnant at time of operation.	Tumor removed with adherent intestine. Anastomosis with Murphy button.	Mesentery and small intestine.	35 cm. of small intestine.	Recovery.
6	"	F.	33	Fibroma.	Swelling in abdomen noticed for 4 years. Severe pain and diarrhoea during last 3 mos.	Tumor very adherent, removed along with adherent intestine.	Between folds of mesentery.	23 cm. of gut.	Recovery.

7	Gildemeister. Inaug. Dis- sert., Breslau, 1902.	M.	41	Pure fibroma weigh- ing 2½ kg.	Since 6 months has noticed hard mass size of child's head in abdomen. Freely movable.	Tumor removed from be- tween folds of mesentery.	Mesentery.	2 cm.	Recovery.
8	"	F.	42	Myxofibroma, weigh- ing 20 kg.	Large growth in abdomen, giving a circumference meas- ure of 2 meters at umbilicus.	Tumor easily removed.	Origin be- tween folds of mesen- tery.	None.	Recovery.
9	"	F.	32	Lipoma, weight 17½ kg.	Continuous abdominal pain for 2½ years. Frequent vomiting and obstipation. Large nodular mass in ab- domen.	Whole abdomen filled with growth distinctly fluctu- ating in two places. Whole growth removed.	Between folds of mesen- tery.	8 cm.	Recovery.
10	"	M.	41	Sarcoma with nu- merous spaces of fatty degeneration. Weight 12½ kg.	Tumor in abdomen which in 5 months developed great size. Tumor filled whole ab- dominal cavity. Was hard, nodular and <i>painless</i> .	Removal of tumor.	Mesentery.	1.27 meters.	Death on 2d day from indefinite causes.
11	"	M.	....	Myxoma with metas- tases in sigmoid flex. and liver.	Was twice operated on in 3 years for mesenteric tumor. First operation removed a growth size of a man's head with resection of 48 cm. of gut. Was then well for 2 years. Had a recurrence, and a smaller tumor with the same amount of gut were again removed. Third recur- rence at end of 9 months.	Third Operation — Tumor about the size of an apple was removed. Numerous adhesions to intestines.	Mesentery.	48 cm. re- moved at 1st and 2d opera- tion each.	Death shortly after third operation.
12	"	F.	....	Lymphangioma.	Tumor with ascites.	Removal of tumor and ad- herent intestine.	Mesentery.	50 cm.	Recovery.
13	Hermes. Deutsch. Med. Woch- enschr. 1901. XXVII, 245.	F.	....	Large spindle-celled tumor, exact nature not stated.	Sick for 2 years with movable tumor in abdomen, beneath umbilicus. Nodular and solid.	Attached omentum in being detached opened pus cavity. Tumor was re- moved with attached mes- entery and bowel. Gut united by Murphy's button.	Mesentery.	Amount of gut not stated.	Recovery with no history of recur- rence.
14	Lexer, F. Ber- lin. Klin. Wochenschr. 1900. XXVII, 4.	M.	41	Fibroma.	Was well previous to April, 1899, when he was seized with colicky pains increas- ing in severity. Tumor pal- pated, freely movable.	Tumor and involved bowel removed.	Mesentery of ileum by pe- dicle attach- ed to verte- bral column.	"Exten- sive."	Recovery in 20 days.

TABLE I.—SOLID TUMORS OF THE MESENTERY—Continued.

Case.	Reporter.	Sex.	Age.	Growth.	Previous History.	Operation.	Attachment.	Resection.	Post-Operative History.
15	From Jahresb. u. d. chir. Abt. d. Spital in Basel, 1901, 61.	F.	40	Sarcoma.	Complained for 4 months of pain in left hypochondrium, radiating from the navel; with gradual development of tumor in middle of abdomen.	"Exploratory." Tumor covered by mesentery with great masses of congested blood vessels. Small intestines pushed to right and colon passing over growth. In pelvis was a large quantity of liquid blood and coagula and fibrin. Operation could not be completed.	Mesentery with no connection with uterus.	None.	Death, with post-mortem diagnosis of "Sarcoma of mesentery with intracranial, fatal hemorrhage."
16	Kownatzki Deutsch Militar. Zeitschrift, 1904, XXXIII, 254.	M.	24	Tubercular tumor the size of a child's head.	Pain in abdomen since April, 1903. Pain (May 5th, 1904) localized to left of navel. No bowel trouble. Fever continued from 13th to 15th, and remitted till 20th. Spleen not enlarged; leucocytes 6000. Anemia. Hard, painful, slightly movable tumor to left of navel.	Abdomen opened over tumor, but nothing more done. Three days later wound was reopened and on account of malignant appearance of growth and metastases in lungs wound was again closed.	Within the mesentery.	None.	Death 2 days after operation. Autopsy: Tuberculosis with metastasis in liver, spleen and lungs.
17	"	M.	21	Lympho - sarcoma. Tumor size of child's head.	Injured by falling from horse. Severe pain in pelvis when admitted to hospital. Next few days had temp. 38.6 C., fainting spells, nose bleed, meteorism, vomiting, severe abdominal pains, diarrhoea and distended abdomen. Later constipation.	Abdominal section for relief of severe symptoms. Tumor not removed. Adherent to intestines and second lumbar vertebra.	Mesentery with extensive intestinal attachments.	None.	Death soon after operation. Necropsy showed stomach and ileum adherent to "brain-like" growth surrounding pelvis of left kidney and ureters.
18	Latouche, Bull. et Min. Soc. de Chir. de Paris, 1900, XXVI, 889.	F.	53	Lipoma.	Woman of large physique and well nourished, presented all the symptoms of an ovarian tumor. Tumor nodular; no ascites.	Removal of tumor.	Between folds of mesentery.	None.	Recovery in 19 days.

		F.	42	Lobulated fibroma.		Began with abdominal pain 3 years ago, with enlargement. Menstruation regular. Abdomen measures 85 cm. in circumference. Of no interest.	Tumor removed. Adhesions to intestines and epiploon.	Mesoileum.	Of bowel involved.	Recovery.
19	Duranon (L.) Revista d. la Soc. Med. Buenos Ayres. 1901, IX, 499.	M.	26	Lymphosarcoma.			.....	Mesentery.	None.	Death following operation.
20	Candido, G. Anal. di Med. Naval Roma. 1904, X, 303.	F.	34	Fibroma, weight 30 lbs., undergoing myxomatous degeneration.		Tumor simulated cyst of ovary. Pelvic organs and kidney healthy.	Removal of tumor through abdominal cavity.	Retro-peritoneal.	None.	Recovery.
21	Doran Brit. Med. J. 1904, II, 1075.	M.	14	Colloid carcinoma. The wall of tumor was very thin and friable, discharging large quantities of amber colored gelatinous fluid.		Swelling in abdomen first appeared 6 months ago. Size of a child's fist, and rapidly increasing in size.	Removed tumor of doughy feel extending in direction of stomach beneath the liver and transverse colon.	Mesentery of transverse and ascending colon.	None.	Death on 3d day.
22	Wanless, W. J. The Indian M. Gaz. 1903, XXV III, 377.	F.	60	Hæmatoma very vascular with fibroid capsule. Mass of tumor is composed of network of fibrin in different stages of organization.		Several weeks of increasing pain and discomfort in abdomen; about a month before operation felt a "lump" in abdomen. Pain became very severe, with vomiting and great depression. Tumor size of man's head and movable.	On opening peritoneum sero-sanguineous fluid escaped. A dense, hard, slightly nodular tumor was found which had twisted the gut to right angles with its long axis $1\frac{1}{2}$ turns, forming a volutus with tightly twisted pedicle.	Mesentery of small intestine.	73 inches of small intestine.	Death on 4th day from bronchitis.
23	Moynihan. Med. Chronicle. Chester. 1902, III, 367.	F.	26	Fibroma.		Symptoms of ovarian tumor.	Tumor removed with its adherent gut.	Mesentery of ileum.	24 in.	Recovery.
24	Murphy, J. B. Clinic Review. 1901, XIV, 193.	M.	40	Sarcoma.		Tumor in central portion of abdomen recognized about 2 months ago by patient. Indigestion prior to that time. Tumor movable but sensitive to touch.	Tumor lay in pelvis from which it was easily brought out, but a portion of small intestine to which it was attached broke and "leaked" into the abdomen, but was promptly controlled. Tumor was removed with a large amount of small intestine.	Mesentery and brim of pelvis.	8 ft. 2 in. of small intestine.	Death in 36 hours from peritonitis.

TABLE I.—SOLID TUMORS OF THE MESENTERY—Continued.

Case.	Reporter.	Sex.	Age.	Growth.	Previous History.	Operation.	Attachment.	Resection.	Post-Operative History.
26	Grandin, E. H. Am. J. Obst., 1902, XLVI, 225.	F.	....	"Hen's-egg, shaped tumor, friable and contents of which somewhat resembled the decomposed yolk of an egg." Dermoid cyst (?) possibly a Colesteoma.	Patient was referred by family physician for removal of abdominal tumor.	Tumor was not readily found but was finally located in mesentery of jejunum, and removed.	Mesentery of jejunum.	None.	Nothing given.
27	Kengla, Louis A. Occidental Med. Times, 1902, XVI, 140.	M.	70	Pure fibroma, weighing 4½ lbs.	Enlargement of abdomen first noticed 3 years previously. No pain or discomfort, but obstipation, which led him to consult his physician.	Tumor and involved bowel removed and anastomosis by Murphy's button. Bowel was peculiarly wrapped around tumor.	Mesentery.	Involved intestine 87 inches.	Died on 3d day.

In reviewing the literature of the past five years there are found twenty-eight cases of solid tumor of the mesentery. (See Table I.) Twenty-seven of these cases I have tabulated for reference. The twenty-eighth case, that of Doleris' (*Gynecologic, Paris*, 1904, Vol. iv, 108) could not be obtained and consequently I am not sure it belongs to this group, so have been obliged to pass it by in the following analysis. An analysis of these cases shows the following:

TABLE II.—SOLID TUMORS OF THE MESENTERY.

Kinds of Tumor	No. of Cases	Recoveries	Deaths	Mortality (percentage)
Fibromata	9	8	1	11.1
Sarcomata	7	1	6	85.7
Lipomata	2	2	0	0.0
Myxofibromata	2	2	0	0.0
Carcinoma	1	0	1	100.0
Lymphangioma	1	1	0	0.0
Tubercular	1	0	1	100.0
Colesteoma (?)	1	1	0	0.0
Hæmatoma	1	0	1	100.0
Myxoma	1	0	1	100.0
Large Spindle-celled Tumor	1	1	0	0.0
Totals	27	16	11	40.7

A further analysis of these cases shows that out of the twenty-seven operations there were 13 resections of gut, varying in length from 4/5 in. in the shortest to 8 ft. 2 in. in the longest. Of these 13 resections, six died and seven lived, or a mortality of 46.15%. Three of these resections were for sarcoma, all of which died. Five were for fibromata and one only died, which gives a mortality of 20%. The number of males affected is 11, ranging in age from 14 to 70 years, against 16 females ranging in age from 8 to 60 years.

In this series of cases the fibromata are most numerous, with the sarcomata a close second. When we consider that Case 11 of series was most probably a sarcoma (since it formed metastases in liver and sigmoid flexure) we have 8 sarcomata against 9 fibromata. With the carcinoma case we have 9 malignant cases out of 27, or 33 $\frac{1}{3}$ % of series.

As to etiology we know nothing, our ignorance being quite as profound as about tumors springing from other sources. Trauma is said to be a cause and we all know how unreliable a history of trauma is, especially when leading questions are asked; still in Case 17 of series the sarcoma was either caused by, or more probably hastened in its course by the patient's falling from his horse and hurting himself badly. Cases are not uncommon in children. Arnstein reported a case at the age of 4 years, and collected nine others in children. The present series shows two in children of 8 and 14 years, while my own case could not have occurred later than 12 years when the patient noticed the growth herself. Most of the cases occurred between the ages of 30 and 45, with the extremes of age from our present knowledge between 4 and 70 years.

All of these tumors seem to have a special tendency to become malignant, sooner or later, even though they may remain benign for years. Most of them become rapidly malignant. This seems especially to be the case in very young patients if growth is rapid. The origin is generally between the folds of the mesentery, or else retroperitoneal; the growth pushing its way between the folds of the mesentery as it enlarges, and at the same time growing backward and becoming attached to the vertebral column. In my own case the origin was probably intermesenteric, with early pedunculation, for the tumor was evidently perfectly free in the abdominal cavity except for its small pedicle.

The diagnosis is never certain and generally it is not known till the abdomen is opened. It will usually be found impossible to differentiate between solid and cystic tumors unless you can get fluctuation, which is rare on account of the consistency of cyst contents. The diagnosis might be made by aspiration, but this is a procedure entirely unwarranted, because of the disturbance the needle produces, and the fact that the presence of a tumor demands operation whether it be cystic or solid. The most common growths with which these tumors may be confounded are ovarian cysts. This confusion can generally be obviated by examining the patient in the Trendelenberg position, when the intestines gravitating toward the diaphragm greatly facilitates diagnosis. The other conditions

with which confusion may be had are tumors of the pancreas and kidney, also extensive hydrops of the gall-bladder, in which condition the distended and freely movable organ may readily be confounded with mesenteric tumor, but its traceable connection with the liver usually makes the distinction clear. Carcinoma of the stomach or intestines and cysts of the spleen are also to be borne in mind. Floating kidney is especially to be remembered, and a diagnosis of this condition would be well-nigh impossible were it not that when a kidney is sufficiently movable to be confounded with a mesenteric tumor it can be caught up and its renal contour readily made out, and the palpating hand can be pressed into the bed-space where the organ should be normally. Cysts of the spleen cannot be differentiated from cystic tumors of the mesentery, and seldom from solid tumors, unless fluctuation can be determined.

In conclusion, the exact diagnosis is not of vital importance, but the *one important thing is to recognize the presence of a tumor early*, which fortunately is easily done. All tumors in the abdominal cavity demand immediate operation no difference what the growth may be, and the mortality will be lowered by a recognition of this fact and the early surgical treatment of the patient. We all, however, like to make an exact diagnosis, and we should never leave anything unturned in our endeavor to arrive at a correct conclusion, provided we do not jeopardize the life of our patient by so doing. We should always bear in mind the best procedure to insure the patient's safety and future health. After all, the best method to arrive at a correct diagnosis is to hold in mind all the conditions that we might have in any given region and confirm or eliminate them one by one till our conclusion is reached.

The only treatment is removal of the tumor just as soon as it is diagnosed.

REPORT OF CASE.—In the latter part of September, 1904, Mrs. M., aged 26, married, was referred to me for operation. She gave the following history:

Family history negative. Measles at age of 8, no other sickness, and was a strong, healthy girl. Patient says at the age of 12 she noticed a movable "swelling" a little larger than a walnut

in her abdomen just to the right of the navel. It gave her no pain and she thought nothing of it. A year later she began to menstruate and her mother noticed the tumor which was then a little larger. Menstruation was normally established and continued regular every four weeks, lasting three days. She was married in November, 1897, at 18 years of age. Her husband says that he noticed the tumor at that time and it was about the size of a "big apple." Soon she became pregnant and on October 3, 1898, after a normal pregnancy and labor her first child was born. After weaning the baby menstruation was again normal and regular till her second pregnancy, in 1901. On March 13, 1902, the second healthy baby was born after normal pregnancy and labor. This baby, as the first, was nursed by its mother.

During all this time the tumor had grown slowly, but a little more rapidly since the birth of the first child, so that two years after the birth of the second child the tumor was about the size of a cocoanut, freely movable, giving no pain or other inconvenience save from its weight. The growth was not rapid till three months before I saw the patient. During the two months prior to my seeing the case the growth had been very rapid, attended by gradually increasing pain and discomfort, being so severe as to confine the patient to her bed for the month previous to my seeing her. She came into the hospital on a cot on which she was removed from her home in Southern Kentucky.

Examination showed an anemic, cachectic, much emaciated patient, with a nodular tumor occupying all the abdominal cavity from just below the ensiform cartilage to the pubes. Palpation showed a fixed mass of very irregular morphology, with a large, hard, rounded nodule in the umbilical region, the rest of the nodules and depressions feeling rather soft and spongy, but no fluctuation. Vaginal examination showed the uterus to be fixed and continuous with the rest of the tumor as far as I could tell, but it presented the peculiarity of the whole pelvis being full of tumor without any definite form. Heart and lungs seemed good. No constipation but severe digestive disturbance. No vomiting. Pulse 120, temperature 102½.

No diagnosis could be made, but I thought it was probably a multilocular adeno-cystoma of ovary with twisted pedicle, with subsequent inflammatory exudate and consequent adhesions.

The condition of the patient was so bad that I did not deem it advisable to attempt operation at once, thinking that probably the condition was largely due to her long, exhausting train trip, and that a few days' rest would improve her condition. During the next two days she improved very slightly. I then left the city and was gone for five days. I returned October 1st only to find the patient *in extremis*. The tumor appreciably enlarged during absence. Temperature 103, pulse 130, with absolute suppression of the urine, which had existed for the past 66 hours. She had been catheterized repeatedly and not a drop of urine. The patient was put in hot packs, given diuretics, etc., without avail. There were absolutely no symptoms of uremia, so I decided to open the abdomen.

The abdomen was opened 72 hours after the complete suppression had occurred, or about six hours after I returned to the city. As soon as the peritoneum, which was injected and inflamed, was opened, brown mucoid, sanguineous fluid began to pour out. A large, round, solid tumor, appeared at the upper angle of the incision, and from this solid tumor above, conforming to the contour of the abdomen, extending into the pelvis and involving the peritoneum, was the rest of the tumor, which was soft, mushy and slimy to feel; bled at every touch, and exceedingly friable without capsule or other covering, and of a raw, dark red color. This friable portion of the tumor was attached to the solid tumor on either side and below, but not above. The solid tumor was easily separated from the soft portion and its pedicle easily tied off and the tumor cut away. The new growth was then thoroughly explored and found to involve everything; entering the peritoneum at all places just as if it were no barrier to its progress. The parietal, intestinal, uterine and tubal peritoneum were all encased in the growth, which filled the entire lower cavity. This new growth was torn away in handfuls to the extent of a wash basin full. The growth resembled a partially organized blood-clot mixed with slimy mucus, more than anything I can think of. Not more than half of this new growth was removed, because the hemorrhage was so profuse and the futility of getting it all away so apparent. What was removed was done so chiefly out of curiosity and hoping to relieve the pressure from over the ureters to see the

effect on the kidneys, believing from the symptoms that I had a pressure anuria to deal with. The cavity was then packed with gauze to control hemorrhage and the ends of the compression packs brought out of the lower angle of the wound, and the abdomen closed. The patient was almost dead from hemorrhage and shock at the stopping of the operation.

Saline was given under the breasts all during the operation and after the patient was put to bed she rallied under strong stimulants and lived for five days.

One of the most interesting features of the case is the fact that in the first twenty-four hours after operation she secreted 12 ounces of urine, 23 ounces the next, and 25 the following day. It was not measured after that, but there was no further suppression till death.

The patient was so much better on the second day that I hoped for sufficient recovery for her to get about again. My hopes were dispelled on the third day by finding my dressings still saturated with the same bloody, slimy fluid that ran from the abdomen on the day of operation. This flow continued without any abatement at all till the patient died of exhaustion five days after operation.

Post-mortem was refused. The solid tumor was round, fifteen cm. in diameter, and weighed 3.7 kg. (about 8¼ lbs.). It had a peritoneal covering except about one-third of the lower side, which was deperitonized by the new growth. The pedicle, which was about two inches wide and one inch thick, was almost identical in structure with the new growth and was apparently the channel of the new growth reaching the cavity.

On splitting the solid tumor open it was found to be fibroid with necrotic degeneration in its center, surrounded by a glistening, grayish white tissue zone which extended into the pedicle and replaced the fibrous tissue of the lower part of the tumor and that part which lay towards the symphysis. Microscopic sections showed the tumor in the non-degenerated portion to be fibroid with small pale nuclei showing poor nutrition. The degenerated new growth, on the other hand, showed masses of vigorous round cells having large clear nuclei with numerous mitotic figures, indicative of rapid growth and characteristic of round-celled sarcoma. The new growth seemed to have sprung

from the pedicle and presented the same microscopic picture as the sarcomatous portion of the original tumor; the cells however, had a decidedly more embryonic look than the former.

This tumor was the most malignant growth I ever saw and the sarcomatous degeneration must have occurred during the last few months, and before that time was a benign growth that could have been easily removed and the patient's life saved.

The lesson is the old story, but forcibly retold. Had the patient not carried this tumor for years, but submitted to operation sooner, both the pathology and termination of this case would have been changed.

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The above are among the more important articles. No attempt at a complete bibliography has been made. References to cases reported are given in Table I.

CHYLOUS CYSTS OF THE MESENTERY.

BY MILES F. PORTER, M.D.,

OF FORT WAYNE, INDIANA,

Professor of Surgery and Clinical Surgery in The Indiana Medical College ; Department of Medicine, Purdue University.

THE basis of this paper consists of a study of the literature on the subject, including the reports of nineteen cases which I have been able to collect, together with one case which occurred in my own practice, of which the following is the report:

J. W., age 22, male. Referred by Dr. A. H. Mouser, of Latty, Ohio. Patient's father was killed by lightning, mother living and well. Both maternal grandparents died of pulmonary tuberculosis. Commencing when he was ten years of age, the patient had numerous attacks of pain in the right lower quadrant of the abdomen. Two years prior to my visit he had a severe attack, which lasted for three months. After that attack he remained well for some months, when he had a milder attack, which lasted a week. This last attack was in July, 1904. In February, 1905, the pain came again and continued intermittently until May 3 of the same year, when I saw him with typical symptoms of obstruction of the bowel. There was a tumor in the right iliac region. Tenderness was not marked and was rather diffuse. The abdomen was markedly tympanitic, and there was no localised muscular rigidity. A diagnosis of appendicitis had been made by Dr. Mouser, in which I concurred. On opening the abdomen through the right rectus a group of chylous cysts was found, together with a volvulus involving that portion of the ileum attached to the mesentery in which the cysts were found. The number of cysts of itself precluded treatment by drainage, their enucleation could not be accomplished without serious danger to the integrity of the gut, besides the vitality of the gut had already been nearly, if not quite, exhausted by the twist. Hence excision of the bowel, together with the mesentery containing the cysts, was done and an end-to-end anastomosis made with the aid of a Murphy button. The abdomen was closed without drainage.

The patient did well until the night of the sixth day, when he commenced to complain of abdominal pain, and died within twelve hours.

A post-mortem examination showed leakage at the mesenteric attachment at the point of anastomosis. The union was perfect throughout the rest of the circumference of the gut. No signs of peritonitis. The button was loose in the gut save for a minute shred of tissue which still held. Figures 1 and 2 are drawings made from the specimen.

Literature.—The literature on the subject so far as the text-books are concerned is very meager. Sutton¹ devotes ten lines to the subject of chyle cysts and Douglas² the same space. Greig Smith³ devotes less than four pages to the entire subject of mesenteric cysts, including their treatment, while Maylard⁴ does not mention the subject. In Treves's "System of Surgery" and in the "International Text-Book of Surgery" will be found the best text-book articles I know of on the subject, but both are very short and imperfect. The current literature contains comparatively few articles upon chylous cysts. Among those which I have found I will mention Bramann's,⁵ Fetherston's⁶ report of a case with the discussion thereon; Mendes de Leon's⁷ and Rasch's⁸ with the discussion. Moynihan in his excellent paper⁹ on "Mesenteric Cysts" devotes three and a-half pages to chylous cysts. Dowd¹⁰ in his paper bearing the same title gives less than two pages to chylous cysts. Carson¹¹ of St. Louis read a paper upon "Chylous Cysts of the Mesentery" before the American Medical Association in 1889. Unjenim and Petroff¹² wrote an excellent paper on the subject and collected all the cases they could find in the international literature.

History.—The history of the development of this subject was until recently inextricably bound with the history of mesenteric cysts in general, and even now this is true in a great degree, though in later years, as our knowledge has grown, a separate study of chylous cysts has been made by a few writers. Cysts of the mesentery were first classified by Portal in 1803. Dowd¹⁰ in his article gives reference to 145 cases of cyst of the mesentery of the various kinds. Unjenim

and Petroff ¹² in 1889 reported the first case of chylous cyst in Russian literature and collected nine other cases from international literature. When Bramann's case was operated (1886) no other case was recorded which had been treated surgically. Kilian ¹³ reported in 1886 a "lymph-cyst" treated surgically; this was two months later than the Bramann case was operated, but before its publication. Carson's case was the first one reported in America, so far as I know, and the largest that had been reported at that time in any country. Rasch was of the opinion that his was the first case of chylous cyst, occurring in a woman, published, but in this he is mistaken, for Kuester and Werth each operated upon a woman in 1882, while the Russian case above referred to antedated that of Rasch a year and Pitman's case was reported ¹⁴ in 1857.

Frequency.—Chylous cysts of the mesentery belong to the surgical rarities. When Carson wrote his paper he was able to collect eleven cases, and the writer has been able to find but nine more, including his own, making in all twenty cases. One of these (Eppinger's) is perhaps doubtful, as he reported it as a dermoid cyst, but Werth considered it a chylous cyst.

Concerning the relative frequency of serous and chylous cysts there is considerable difference of opinion among writers. Hahn ¹⁵ says that serous cysts are the more common, while Smith ¹⁶ and Dowd ¹⁰ say that chylous cysts are the more common. In my own research in current literature I have found twenty-nine cases of serous cysts and twenty cases of chylous cyst and am, therefore, forced to side with those who think the serous cysts more common.

Pathology and Etiology.—Dowd ¹⁰ in speaking of the origin of chylous cysts says: "Taking these cysts together it seems pretty well established that the chylous cysts are pre-formed cysts, situated in such close relation to the lacteals that chyle has been effused into them and that they are really of embryonic origin; in structure similar to ovarian and parovarian cysts."

The microscopic examination of the specimen removed from Rasch's patient seemed to show in this case that the tumor originated from the rupture of a chyle vessel probably produced by trauma, and in the discussion of this paper Doran



FIG. 1.—Author's case. Showing bowel with mesentery and cysts excised. Multiple.

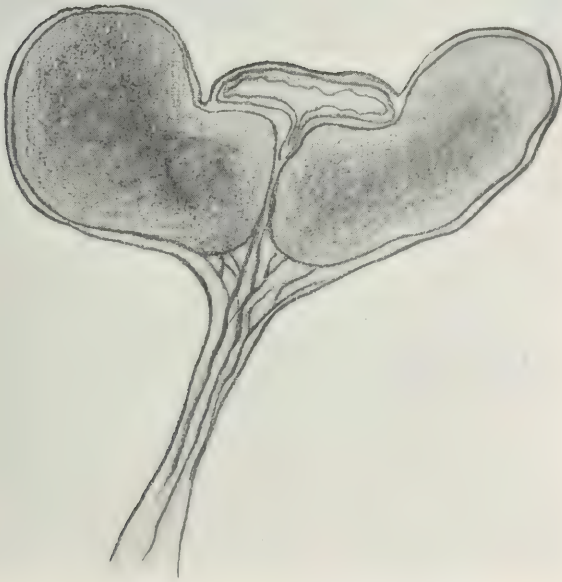


FIG. 2.—Drawn from transverse section through specimen from author's case. Showing flattening and compression of bowel by cyst.



FIG. 3.



FIG. 4.

agreed entirely with this view. Upon similar evidence it was determined that Fetherston's case⁶ originated in a lymph gland. The specimen from Bramann's case⁵ presented no endothelium nor epithelium on the inner surface of the cyst wall and originated most probably, as did Rasch's, from the rupture of a lymph vessel. According to Carson¹¹ eight of the cases collected by him were due to degeneration of lymph glands and three to dilatation of lymphatics. Von Blum suggests as a common origin typhoid or tubercular degeneration of mesenteric glands.

That a few cases of chylous cysts have been reported which had their origin in the dilatation of the receptaculum chyli or large retro-peritoneal lymphatics there can be no doubt, but cysts having this origin are not likely to occupy the mesentery but are usually in close contact with the spine, as in the case reported by Scharlemmer.¹⁷ In my own case there were several distinct and relatively widely-separated cysts. Chemical and microscopical examination of the contents of the cysts proved it to be chyle. The report of the microscopical examination of the specimen, made by D. J. B. McEvoy is as follows:

The gross specimen submitted for examination consisted of a portion of intestine about four and one-half inches long with attached mesentery. In the mesentery there were several cysts from which the fluid had been evacuated.

The specimen illustrated in photograph number 3, was taken from the wall of a large cyst next to the bowel. A cube was removed from the floor of this cyst next to the intestine and included a portion of the bowel wall which was continuous with the base of the cyst. Microscopical examination of this cube shows a great increase in the lymphatic tissue of the bowel wall. The bowel mucosa still shows the outline of the secreting glands, which are normal to the part, but the epithelial lining has been destroyed and the lumen filled with lymph-cells. These lymph-cells also distend the periglandular structure. In some places we find a layer of lymph-cells covering the mucosa. Beneath the mucosa, infiltrating the muscular layer of the bowel and extending upwards to form the floor of the cyst, was a mass of lymphatic tissue consisting of cells in all stages of ameboid movement.

Photograph number 4 was taken from a section of an enlarged mesenteric gland in the vicinity of the cyst.

Microscopical examination shows capsule to be intact. The structure does not differ from the normal gland except we find a general hyperplasia of all the elements.

The photograph shows the lymph spaces of the periphery and compact masses of lymph tissue below.

These micro-photographs were made with the low power to include a wide field.

Undoubtedly, then, we are warranted in coinciding with Moynihan⁹ in the opinion that the origin of chylous cysts is manifold, and disagreeing with Dowd¹⁰ when he says that they are all embryonic in origin. It naturally follows that there can be nothing constantly distinctive in the pathology of chylous cysts of the mesentery except their contents and their location between the folds of the mesentery. Microscopically glandular endothelium will be found in cysts originating in degeneration of lymph-glands and endothelium in those originating from dilatation of lymph vessels; provided, however, atrophy of these elements has not resulted from pressure. Naturally those cysts arising from rupture of lymph-vessels will not present endothelium on the inner surface of their walls.

These cysts may be unilocular or multilocular, single or multiple. Multilocular chylous cysts may undoubtedly become unilocular by pressure-absorption, just as obtains in ovarian cysts. It is also possible for multiple cysts to become by this same process first multilocular and single and finally single and unilocular.

In appearance these cysts are usually creamy white and have large vessels traversing their walls. Accidents such as volvulus, hæmorrhage into the cyst or cyst-wall and peritonitis may change their color and render the vessels indistinct. Usually these cysts have no distinct pedicle, but they may have. The relation of the bowel to the cyst varies much. The accompanying illustrations (Figs. 5, 6, 7, and 8) show some of the varying conditions that have been noted along these latter lines.

Diagnosis.—An exact diagnosis is practically impossible, neither is it necessary. It goes without saying that one cannot have any idea of the character of the cyst contents until he sees it, unless tapping is resorted to, and this proceeding is to be condemned.

Developing in the mesentery of the small intestine, as the large majority of these tumors do, their location and

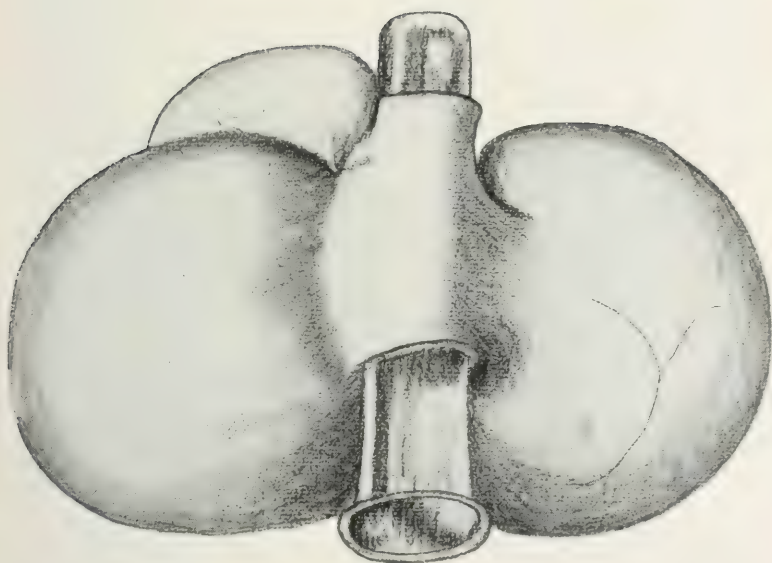


FIG. 5.—From Moynihan. *Annals of Surgery*. Vol. XXIV. Tube passes through gut.



FIG. 6.—From Moynihan. Showing cyst with pedicle. Gut was strangulated from traction on pedicle. Unilocular.

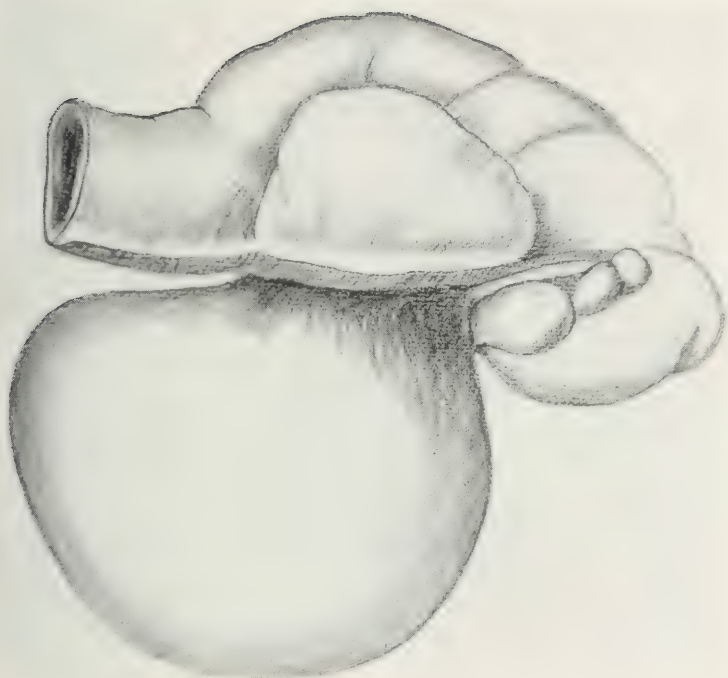


FIG. 7.—From Moynihan, Multilocular cyst.

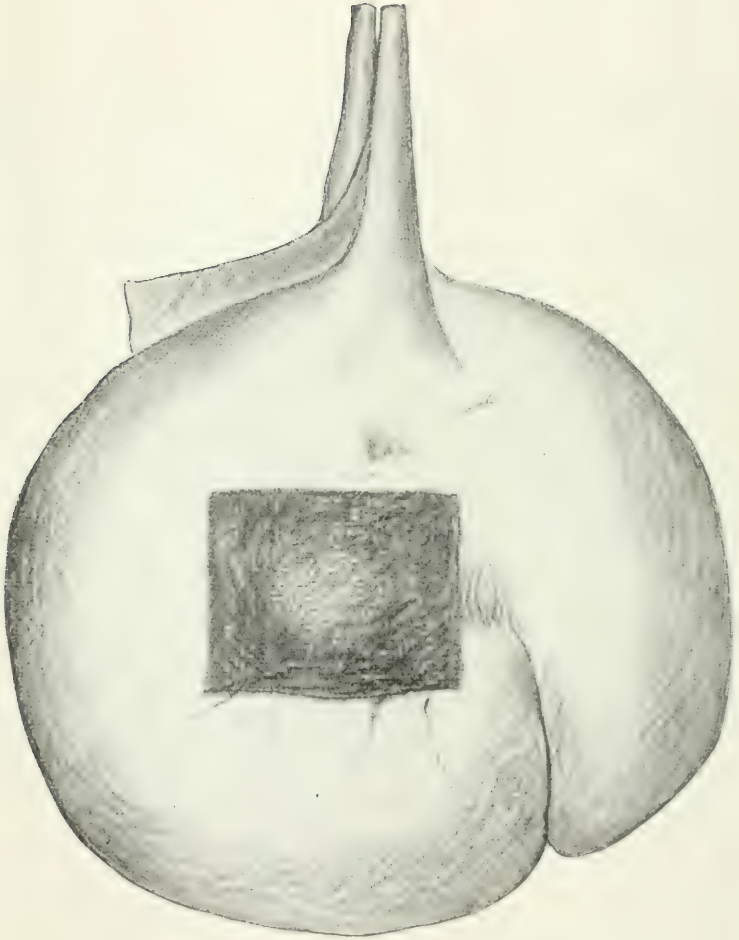


FIG. 8.—Robson's case. From Moynihan. Small pedunculated cyst.

attachment, when the latter is determinable, is somewhat distinctive. A centrally located, movable, fluctuating tumor would raise a strong suspicion of mesenteric cyst, and if the tumor were crossed by a portion of intestine the suspicion would become a conviction. Cysts of the mesentery more often cause abdominal pain than do any cystic abdominal tumors. Hence the diagnostic significance of pain in these cases. The same thing may be said of vomiting, also. Especially significant are these symptoms if unaccompanied by signs of infection or other complications. Von Blum¹⁸ was the first to call attention to the diagnostic significance of recurring attacks of volvulus in mesenteric cyst. The patient whose case he reported had had five or six attacks prior to time of operation. This was true of my own case and also of several others of which I have read the reports.

Recurrent attacks of belly pain, accompanied by symptoms of bowel obstruction in a case presenting a centrally attached abdominal tumor, would strongly suggest mesenteric cyst.

Chronic increasing obstinate constipation is not infrequently present in these cases and is due to the stretching and flattening of the bowel as it crosses the cyst.

The age of the patient is of little or no diagnostic importance. A number of cases under ten years are reported, but the average age in fifteen cases was found to be over thirty-four years.

The frequency with which the history of trauma is given by these patients would seem to show that this might be of some aid in differential diagnosis. In some cases, as in my own, for instance, where there were a number of relatively widely separated small cysts which produced no appreciable tumor until volvulus resulted, even an approximately correct diagnosis will not be possible before the abdomen is opened.

With care, however, the diagnosis of mesenteric cysts may be made in the majority of cases, though the character of the cyst contents cannot be determined until the abdomen is opened.

Treatment.—That mesenteric cysts of all kinds seriously endanger life there can be no question, hence there can be no

question but that their removal as soon as the diagnosis is made is the only proper line of treatment to follow. As to exactly what method should be adopted in their removal there is great difference of opinion, but it appears evident that this difference arises from the fact that conclusions have been reached from too narrow premises. Those cysts which have a well-defined pedicle are best removed after ligating the pedicle, as in ovarian cysts. Others may be easily and safely enucleated; others will be best treated by stitching the open sac to the parietal peritoneum and draining.

The fear entertained by some, and very naturally, that there might be danger of a permanent chylous fistula in cases treated by drainage has proven unfounded.

There are other cases in which resection of the bowel, together with that portion of the mesentery containing the cyst or cysts, will be required. Such a procedure seemed best in my case. Drainage was out of the question because of the number of the cysts, while either enucleation or excision would certainly have led to gangrene of the bowel.

CONCLUSIONS.

1. Chylous cysts of the mesentery are to be classed with the surgical rarities, being less common even than serous mesenteric cysts.

2. Many chylous cysts of the mesentery begin as multiple cysts, later become multilocular and finally unilocular by the process of pressure-absorption.

3. The origin of chylous cysts is manifold and the microscopic pathology varies equally.

4. Trauma seems to be a causative factor in quite a number of chylous cysts.

5. Diagnosis of cyst of the mesentery may be impossible, but in the majority of cases can be made before opening the abdomen, but the character of the cyst contents cannot be determined by any safe procedure until the belly is opened.

6. The treatment of chylous cysts of the mesentery consists in their removal by that technic which seems best adapted to the case in hand after it has been studied through the open abdomen.

TABLE OF CASES.

No.	Reporter.	Where Reported.	Age.	Sex.	Origin.	Operation.	Result.	Remarks.
1	Bramann.	Langenbeck's Archiv, Vol. 35.	63	M.	Receptaculum chyli. Between folds of mesentery.	Incision, walls stitched to skin and drained.	R.	Tumor was size of child's head.
2	Kilian.	Berlin. K. Woch., Nov. 25, 1888.	61	F.	Thoracic duct.	Incision and drained.	R.	Had been tapped twice and refilled (4700 cc. chyle withdrawn).
3	Kuester.	Ein Chir. Erkenntniss, Berlin, 1882.	21	F.	Between folds of mes- entery.	Extirpation.	D.	Death due to peritonitis from wounding bowel. Size of adult head
4	W.	Milliard and Tilhaut's paper, Berlin. K. Woch., 1887, No. 23.	31	M.	Degenerated mesen- teric gland.	Extirpation.	R.	Kidney size.
5	Werth.	Archiv. f. Gynecol., 1882. Vol. 19.	?	?	Mesenteric gland.	Extirpation.	R.	Size of child's head.
6	Wyeinin and Petroff.	Dhevnik Kazans Kaho Obsch. Warchis, Nos. 7 and 8, 1888; also London Med. Record, Aug. 20, 1888.	26	F.	Mesenteric glands.	Extirpation.	R.	Case was Wyeinin and Petroff's, operated by Fenominoff.
7	Carson.	Jour. A. M. A., May 10, 1890.	42	M.	Not known.	Incision and drainage.	R.	Large as adult head. Wall very thick and hard.
8	Moynihan.	ANNALS OF SURGERY, July, 1897.	18	F.	Mesentery of ileum.	Enucleation.	R.	Operated in second attack of pain, ten- derness and vomiting.
9	Moynihan.	ANNALS OF SURGERY, July, 1897.	7	M.	Mesentery of ileum.	Pedicle ligated and cyst removed.	D.	Pain, tenderness and vomiting were symptoms.
10	Syms.	ANNALS OF SURGERY, Vol. 23, p. 605.	19	M.	Mesentery of ileum.	Cyst enucleated, mesen- tery closed.	R.	Contained 14 ounces of chyle.

TABLE OF CASES—Continued.

No.	Reporter.	Where Reported.	Age.	Sex.	Origin.	Operation.	Result.	Remarks.
11	Eppinger.	By Carson in Jour. A. M. A., May 10, 1890.	Not given.	Not given.	Not given.	Found post mortem.	....	Reported as dermoid, but regarded as chylous by Werth.
12	Rosch.	Trans. London, Obs. Soc., 1889.	27	F.	Mesentery of small bowel.	Cyst stitched to abdominal wall and drained.	R.	Six pints of chyle. Pain in belly led to discovery of tumor.
13	Mendes de Leo.	Amer. Jour. Obs., Vol. 24, 1881.	27	F.	Not given.	Cyst opened, stitched to abdomen, drainage.	R.	Tumor very movable and caused severe pain.
14	Fetherston.	Australian Med. Journal, 1890. New Series, No. 12.	33	F.	Mesentery of ileum.	Well - formed pedicle, transfixed and tied.	R.	Three pints chyle. Had had several severe attacks of belly pain. Glass drainage in abdomen.
15	Porter.	Present paper.	22	M.	Mesentery of ileum, degenerated lymph-glands,	Excision of cysts with bowel, anastomosis with Murphy button.	D.	Died from small leakage of mesenteric attachment, which occurred on seventh day. Numerous attacks of belly pain.
16	Rokitavsky.	Lehrbuch der Pathol.	53	M.	Mesenteric gland.	Found post mortem.	....
17	Enzmann.	Basle Quang. Dis.	77	F.	Thoracic duct.	Patient died of endocarditis.	....	Walls of cyst thick and flabby. Contents inspissated chyle, cinnamon brown in color.
18	Rokitavsky.	Lehrbuch der Pathol.	36	M.	Mesenteric gland.	Found post mortem.	....	Several small cysts with thick walls and white contents, and one size of child's head, lobulated and containing ropy fluid with glutinous red and black lumps.
19	Virchow.	Berlin. K. Woch., Nov. 14, 1887.	Not given.	Not given.	Not given.	Post mortem.	....	Multilocular.
20	Pitman.	Brit. Med. Jour., May 16, 1887.	23	M.	Mesentery of small bowel.	Post mortem.	....	Patient died of peritonitis due to bowel obstruction.

SUMMARY OF TABLE.

Whole number of cases reported, 20.

Number operated upon, 14.

Total deaths in operated cases, 3.

Number of cases treated by excision or enucleation of cyst, 8, of which 6 recovered and 2 died.

Number of cases treated by incision, stitching sac to abdomen and draining, 5, all of which recovered.

One case treated by excision of cyst, mesentery, and bowel, died.

Only 6 cases were found reported post mortem, which would seem to prove that when present chylous cysts of the mesentery usually manifest themselves by symptoms sufficiently pronounced to lead the host to consult a physician.

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- ¹⁸ Jour. of the A. M. A., Jan. 11, 1902, p. 139.

PERFORATING DUODENAL ULCER.

BY J. M. ELDER, M.D.,

OF MONTREAL,

Surgeon to the Montreal General Hospital; Assistant Professor of Surgery and
Lecturer on Clinical Surgery, McGill University.

J. S., aged 38, came to the Montreal General Hospital at 6 P.M., November 15, 1905, stating that while driving his express wagon that afternoon he had been seized with severe pains in the epigastrium. Associated with this pain, which came on quite suddenly there was violent retching and vomiting. He does not know the character of the material vomited, and says he was quite "out of his mind" on account of the agony he was in. There had been no previous history of illness, except an attack of abdominal pain eight years ago, which confined him to bed for a few days and kept him from work for about a month. He is not very clear about the details of this illness, but does not think he had any vomiting at that time. No illness since except indisposition following a "spree" or from a temporary bronchitis. Has used tobacco a great deal since youth, and up to three months ago had been a pretty heavy drinker, but for the past three months has abstained entirely from alcoholic beverages. He is a married man, with a healthy family, and his clinical history is good.

Condition on Admission.—Tall, well built, strong man; complains of constant lancinating pain in the abdomen, with maximum intensity over the ensiform cartilage. He has vomited several times since admission, always accompanied by very severe retching, and the last two or three times vomitus has been well tinged with bright blood. There is no marked shock; temperature 99°; pulse 72; respiration 24. There is no evidence of any mental disturbance, and reflexes are normal. There is a very slight pallor; extremities somewhat cold; no œdema. No evidence of any hernia. Heart and lungs negative; chest emphysematous. He complains constantly of very severe pain. The abdominal wall is well retracted, and the muscles stand out on

both sides symmetrically. There is most marked rigidity throughout the abdominal area, a little more pronounced, perhaps, in the epigastrium. No mass can be felt. Palpation elicits generalized pain only, nothing local; on percussion the note is fairly tympanitic throughout, the right flank being somewhat less resonant than any other portion. The liver dulness is about normal, although the lower margin cannot be palpated. On account of the extreme agony of the patient it is rather difficult to conduct a satisfactory examination, but there appears to be a dull area in the hypogastrium, which it was thought might be due to a distended bladder, but which did not disappear upon passing the catheter. A hypodermic of morphia, $\frac{1}{4}$ gr., was given, heat applied to the extremities, and the case watched carefully for a time.

When the patient was seen again, about nine o'clock that evening, the temperature had gone up to $100\frac{2}{5}^{\circ}$, pulse 96, and there was distinctly more rounding up of the abdomen, with an increase in the dull area in both flanks. The board-like rigidity of the abdominal muscles still persisted. Vomiting, too, was still present and in the vomited mucus there was a little fresh blood. A diagnosis was made of perforated gastric ulcer, notwithstanding the fact that there had been no previous history of digestive disturbance. Operation was decided upon and carried out at once.

After the usual preparation, and under ether anæsthesia, a median incision was made extending down from the ensiform cartilage towards the umbilicus, and upon opening the abdominal cavity free gas escaped. It was then found that the pyloric end of the stomach and the first part of the duodenum were adherent to the under surface of the overhanging liver. There was very little inflammatory reaction present, but upon separating these two adherent organs, a round perforation was found in the duodenum about three-fourths of an inch from the pyloric valve. It was situated in the anterior wall of the duodenum and was of sufficient size to admit an ordinary lead pencil. It was clean, punched-out, with apparently very little undermining or erosion of the neighboring mucosa inside. The duodenum was brought out through the incision and the ulcer closed by simple suture, without excising its borders. The closure of the ulcer did not encroach upon the

lumen of the gut sufficiently to indicate a pyloroplasty. A reinforcing row of Lembert sutures were then introduced, and, for the sake of further security, a portion of the gastrohepatic omentum was sutured down over the site of the perforation. Looking down towards the lesser sac there appeared to be very little pus or other inflammatory material, and it was very easily wiped out and the parts returned to their normal position.

The next step in the operation was to make a counter opening in the abdominal cavity below the umbilicus in the median line, and here we came upon a very different state of affairs. The great omentum, coils of intestine, and the peritoneum generally, were very much reddened and injected, and large quantities of sour-smelling, seropurulent material were found filling all the spaces below; and especially had it gravitated down into the pelvis and also into the flanks. A large drainage-tube was introduced here, and a stream of warm (105°) normal salt solution introduced through the upper wound and allowed to flow freely out here. With this drainage-tube passed well down into the pelvis, giving free egress to the flow of water coming in through the upper opening, the abdominal cavity was thoroughly irrigated. Many particles of food which had been taken at the midday meal, notably some pieces of corn, pieces of potato, etc., could be identified as they came out of this lower wound. After irrigating till the water returned perfectly clear, a large drainage-tube was inserted down into the pelvis; the upper wound was closed in the usual way, without drainage, and the lower one down as far as the drainage-tube. The abdomen was left as full as possible of the normal saline solution, and the patient returned to bed, the head of which was raised about 1½ feet, so that the abdominal contents might gravitate towards the drainage-tube which was left in the pelvis. ("Postural Drainage.") The contents of this tube were aspirated out every hour for the next 24 hours. The patient recovered very well from the shock of the operation and was fed entirely by rectum for four days. The post-operative temperature never at any time exceeded 101°, and became normal on the third day after operation and remained so until the recovery of the patient.

The convalescence was rapid and quite uneventful in every way. The drainage-tube was removed on the fourth day as the

discharge had ceased, and moreover the cultures from the peritoneal cavity, taken at the time of operation, were returned by the bacteriologist with a diagnosis of "no growth." Patient left the hospital on October 5, and since then has been in normal health and is now following his usual vocation of express driver. He is able to eat anything that he wishes, although cautioned against excesses in any form.

Some interesting points in this case are: (1) The fact that a perforating duodenal ulcer was present without any previous symptoms in a man apparently strong and healthy. (2) That with a perforating duodenal ulcer one may get bright red blood in the vomited material and thus point to a diagnosis, as in this case, of perforating gastric ulcer. The absence of previous gastric symptoms may be explained by the fact that this was a duodenal ulcer and not a gastric one; although, contra, it is a well-known fact that duodenal ulcers do give gastric symptoms. One is here reminded of the remark attributed to one of the Mayos, that, "in operating upon gastric ulcer it is always well to make the incision *to the right of the median line*, as the majority of gastric ulcers are duodenal." Mr. Caird, of Edinburgh, in his address before the Canadian Medical Association at its Halifax meeting last summer, pointed out the frequency with which gastric ulcer affected the pyloric region, as distinguished from all other parts of the stomach; and one can easily fancy that whatever the etiological condition was that might produce a gastric ulcer on one side of the valve, the same condition might very easily produce it a few centimeters on the other side. So that it is hard to draw a hard and fast line between gastric and duodenal ulcer; in fact, often clinically impossible.

As regards the operation itself, it was a good illustration of the necessity of following a surgical rule in any given operation. The well-known rule in operating upon gastric perforation, where there has been possible escape of stomach contents, is that the operator should always make a counter opening *below* the umbilicus in order to determine the condition of the general abdominal cavity. Had we failed to do so in this case we would most assuredly have lost this patient by

subsequent general peritonitis. The condition of the peritoneum at the site of the perforation appeared to be so good that one could have scarcely believed that the state of affairs further down in the abdominal cavity should have been so shocking as we found it to be when we made the second opening. This case is, further, an illustration of the good result that follows early operation, a point which Mr. Caird's series of cases so well proved. The delay in operating upon this case was not to give time for shock to pass off, there being little shock present; but was entirely due to the fact that the patient at first absolutely refused operation, and only consented upon the solicitation of his relatives and his spiritual adviser, all of whom had to be summoned to the hospital. I am quite convinced that had we delayed operation until the morning, a fatal general peritonitis would have supervened.

PRACTICAL POINTS IN THE SURGERY OF THE LARGE BOWEL, EXCLUSIVE OF THE RECTUM.¹

WITH ILLUSTRATIVE CASES.

BY CHARLES B. (G. de) NANCRÈDE, M. D.,

OF ANN ARBOR, MICHIGAN,

Professor of Surgery and of Clinical Surgery, University of Michigan, and in Dartmouth Medical College.

No effort will be made to determine the ultimate fate of the class of cases dealt with in this paper, its object being to indicate what the author has found clinically the best practice when an operation has, for adequate reasons, been decided upon, and the various expedients at our disposal when dealing with complications.

I shall deal with certain conditions and illustrate them practically, not theoretically, by briefly rehearsing the history of an appropriate case, with some comments on technique.

I shall sedulously endeavor to omit all non-essential details, only emphasizing such points in the history of my cases, or the operative technique, as exemplify the facts upon which I desire to lay stress, which in brief are: (1) What can and should be done in certain classes of cases; (2) Why that which is most desirable in theory is sometimes both inexpedient and impracticable as a primary measure, although it can be resorted to successfully later; and (3) how purely palliative operations, under certain circumstances, will secure safely all the benefits that a more dangerous radical procedure offers.

My first contention is that there are a certain number of the most desperate cases of perforative peritonitis of appendicial origin which can be saved for later radical procedures, provided much operative interference is avoided at the outset. How often have I regretted an exhaustive search for a perforation in cases where my surgical instinct should have taught

¹ Read in its present form before the Saginaw County Medical Society, Michigan, December 5, 1905.

me to simply drain, giving a possible chance for a late operation, instead of preventing any possibility of a late intervention by killing my patient in attempting to do an ideally complete operation. It is because it is so much harder to decide when *not* to do a given thing than when *to do* its opposite, that many of our operations fail to do any of the good that they are capable of effecting.

CASE I.—The patient, C. B., aged 20 years, was admitted to the University Hospital October 22, 1903, on the 21st day of an attack of appendicitis, with what appeared to be generalized peritonitis. The boy was in such a desperate condition it seemed hardly proper to intervene, but a rapid draining operation was decided upon and the usual oblique incision on the right side gave vent to large quantities of free pus intermixed with gas bubbles. My assistant made a corresponding opening on the left side and a stab wound in the same loin posteriorly, while I duplicated this on the right side. The bowel beneath my first wound was apparently gangrenous. The whole abdomen seemed to be full of pus, and was flushed out with many gallons of hot salt solution, and rubber-tube drains were passed through all four openings, with an additional cigarette drain placed in the deep pelvis, and a strip of iodoform gauze carried up to the under surface of the liver. These last two drains were removed in forty-eight hours, when all four openings gave exit to fecal matter. After a hard struggle the boy recovered enough to be walking about the wards, but the fecal fistula would not close. Accordingly on January 22, 1904, the abdomen was entered and the adherent margins of the opening into the bowel were separated from the abdominal parietes. In separating some adherent loops of small bowel three perforations were made, two of which were at once closed by a double row of sutures, one including all the coats, the others being seromuscular. The third perforation was just below the ileocæcal valve, the large opening into the colon being just above the valve, leaving only a bridge of tissue between. I therefore resected a V-shaped portion of the colon and ileum, including the ileocæcal valve, and united the cut edges transversely by a row of through-and-through stitches, which were then buried by interrupted seromuscular sutures, reinforcing

the anastomosis by lightly catching the omentum down over it by a few stitches. After a rather serious course he convalesced, leaving the hospital March 7, 1904, well.

A search for the opening or openings at the first operation would undoubtedly have killed this lad. Still further, could the gangrenous areas of bowel have been quickly and easily reached, no stitches would have held, extensive resection would have become requisite, and the patient, I am confident, could not have survived any such procedure; but by free drainage and irrigation he was preserved for a successful secondary resection.

The second case which I shall quote is one which probably will be claimed by some to also show how previous chronic lesions, such as old ulcers of the gastro-intestinal tract, frequently serve as starting points for malignant disease. This case also shows that even the experienced practitioner, still more the tyro, should carefully consider all possibilities in every case of trouble located in the right iliac fossa, and not off-hand decide that every patient suffering from pain and a mass in this region has appendicitis.

CASE II.—C. W. B., aged 65 years. Entered the University Hospital March 15, 1904. His history in brief was, that he had had pain in the appendicular region with a tender mass detectable by palpation just outside the crest of the ilium. This mass was dull on percussion, smooth, somewhat movable and was said to disappear at times, by which was probably meant that difficulty was experienced in recognizing it, owing to its change of position from distention of the bowels with flatus and the consequent increased rigidity of the abdominal muscles, which were always somewhat tense. He had had two alleged attacks of typhoid fever when serving in the army during the Civil War; diarrhoea, lasting three or four months, followed each attack, succeeded by pronounced constipation, which latter symptom persisted up to the time of onset of the present trouble. This was sudden, consisting in a severe attack of pain in November, 1902. This lasted but a few hours, but in February, 1903, another more severe attack occurred, a small tumor being detected by

his physician the next day. Neither fever nor vomiting ever occurred during these or the subsequent attacks, which were frequent, but during the intervals some pain and the tumor persisted. In May, 1903, a severe attack of pain led his physician to prepare him for an appendectomy, but rapid improvement led to postponement of any operative interference. His old constipation gradually increased, but there has never been any pronounced symptoms of obstruction, unless the paroxysms of pain resulted from interference with the free passage of flatus and feces. Since the latter part of December, 1903, the right-sided pain has been worse and interfered with his sleep. A diagnosis of carcinoma of the cæcum was made, founded chiefly on the presence of a steadily enlarging but movable tumor unattended by fever, and the symptoms of what was believed to be partial obstruction. March 21, 1904, by an incision parallel with the right rectus muscle, after an exceedingly difficult operation of over two hours' duration, the caput coli, the ascending colon and some inches of the ileum with numerous mesentric lymph-glands and much infiltrated mesentery were removed, and the cut ends of the intestines were united by several rows of interrupted silk sutures, the first including all the coats of the bowel, the others being seromuscular. The omentum was brought over the line of suturing and a cigarette drain introduced. Despite the formation of a slight fecal fistula, recovery promptly took place, the patient leaving the hospital May 24, the wound soundly healed; when last heard from he considered himself well. The technique in this and the succeeding operations being in no way peculiar, the details are omitted.

The next four cases present certain features in common to which I would call attention. There were widespread adhesions between the neoplasm and other viscera, the cases where the bladder was concerned demonstrating its involvement by suggestive symptoms before operation. Adhesions of a neoplasm to other organs seem to be at times purely inflammatory and do not necessarily mean neoplastic infection, although this is too often the case. To properly deal with either malignant or tubercular processes within the abdomen it is often impossible to avoid superficial or even penetrating

damage of the hollow viscera, but this can be readily repaired and should not deter us from radical procedures. Again, the admirable advice to resect the mesentery in such a way that a well vascularized portion is left projecting beyond the cut end of the intestine is often absolutely impossible to follow, with the thickened infiltrated mesentery met with in many cases. Finally, the end-to-end anastomosis of the small with the large intestine often leaks, despite all precautions taken, because of the portion of colon often found uncovered by peritoneum between the layers of the mesocolon.

CASE III.—*Adeno-carcinoma of the transverse colon and sigmoid.* Death. Mrs. L. T., age 56. Health apparently good until the last few months, when she experienced pain in the left lower abdomen and a physician detected a tumor. Vomiting and nausea immediately set in, attributed to medication, with frequent, painful micturition, some incontinence, and the urine was "deep red," malodorous, a heavy sediment being thrown down. The vesical symptoms lasted only two months, producing much loss of sleep and flesh, but the urinary symptoms had nearly ceased on her admission to the hospital. Omitting details, an irregular, freely movable tumor as large as the fist, was made out in the left inguinal region, which was not attached to the uterus. The proctoscope could be passed up beyond the growth, which could be moved over the anterior surface of the instrument.

November 7, 1904, I delivered through a vertical incision, made by splitting the outer portion of the left rectus muscle, a mass of intestines and omentum adherent to the bladder, from which separation was finally effected without penetration of this viscus. A loop of adherent small intestine was slightly torn during the separation and was at once repaired by celluloidin thread sutures. The tumor was now seen to consist of the splenic flexure of the colon, which had become adherent to the sigmoid, necessitating the removal of several inches of bowel in both localities, as the remains of the sigmoid and transverse colon could not have been brought together if the two diseased areas had been excised with the intervening ascending colon. The union at both points of resection was made end to end by celluloidin thread sutures and proved mechanically competent on the post-mortem eight days later, when the bowel at the upper anas-

tomosis was found gangrenous and perforated. Several free movements of the bowel had been secured before perforation took place.

Unquestionably it would have been much better to have made a right-sided colostomy instead of resecting, but so much damage had been done while determining the exact condition of the parts that resection seemed imperative. If I meet with a similar case I shall resect both diseased areas, make an anastomosis at the site of the lower resection, and establish a temporary colostomy by securing the ends of the bowel resulting from the upper resection in an incision of the abdominal wall. This would probably enable the anastomosis to heal securely, while later the colostomy could be safely closed by a secondary operation.

Another common error is to fail to recognize that malignant disease of the bowel does occur with sufficient frequency in the young to demand careful consideration when the clinical symptoms and signs point in this direction, as is demonstrated by Case IV, where the disease probably commenced during the latter part of the patient's eighteenth year.

CASE IV.—*Carcinoma of cæcum*. Recovery. M. R., aged 20 years, was admitted to my service May 3, 1905, with a history of attacks of sharp pain during the last year located in the umbilical region. He was occasionally nauseated and had vomited some six times in all. The pain on each occasion lasted only two or three hours. He was able to work until three weeks before admission. Constipation existed, but no pronounced obstructive symptoms. Fever was absent.

A tumor to the right of the umbilicus was detected by my assistant, Dr. Darling, who operated at my request and in my presence on May 16, 1905. A vertical incision, splitting the right rectus muscle, was made from above the umbilicus nearly to the pubes. The omentum was adherent to a large mass consisting of small intestine, cæcum and ascending colon, the mass extending well down into the pelvis behind the bladder. After clamping, the caput coli, ascending colon and small intestine to the extent of thirty-five inches was removed, with the correspond-

ing mesentery. A Murphy button reinforced by interrupted silk sutures secured an end-to-end anastomosis. Convalescence was fairly smooth and the patient left the hospital June 14, 1905, with sound healing, but with retention of the button in the sigmoid, it was believed, on the evidence of a skiagraph.

CASE V.—*Massive tuberculosis of large intestine and ileum.* Recovery. E. H., aged 39, entered the University Hospital May 22, 1905, having first noticed occasional abdominal pain late during the summer of 1904, but toward the end of November, 1904, he was attacked by severe pain in the right inguinal region with repeated vomiting. Nothing new was noticed until about Christmas time he had a sharp attack of diarrhœa. On January 21, 1905, his physician detected a small tumor which could not always be made out, according to patient's statement, but on my examination a large somewhat movable mass was detected in the right lower abdomen. May 25, 1905, I delivered by an incision splitting the right rectus muscle a series of nodular, papillary tumors involving the caput coli and small intestine, forming a large adherent mass, with apparently healthy intervening areas of small intestine. The lumen of the colon was almost closed, the bowel walls being enormously thickened by an infiltration which could only be distinguished from schirrus by the microscope; indeed macroscopically, the pathologist thought it was scirrhus. The involved areas were removed with the corresponding mesentery, comprising the caput coli, ascending colon and small intestine, measuring $3\frac{6}{4}$ inches. A Murphy button was employed for an end-to-end anastomosis, reinforced by interrupted celluloidin thread sutures. A fecal fistula formed at the end of about a week but promptly closed, leaving however a tubercular fistulous tract which now discharges so little as only to require an occasional dressing. He passed the button on the 21st day and has recently resumed his work as a stationary engineer.

CASE VI.—*Carcinoma of the caput coli.* Recovery. F. D., age 38 years, entered the University Hospital June 3, 1905. In February, 1905, he frequently had severe pains, as he described it, "in the stomach," commencing shortly after eating; these attacks of pain continued for two weeks, the intensity varying from time to time. This pain prevented him from working, but

after the lapse of some weeks he became so free from discomfort that he resumed work, but in the first week of May, 1905, while working he experienced a sudden pain to the right of and below the umbilicus, which ceased after a day's duration, but he now detected a swelling in the painful region. Another period of freedom from pain obtained until November 28, when severe paroxysms recurred, to be repeated on the next day, and on May 31st. The patient failed to note any increase in the size of the tumor, but it was extremely tender on pressure; there had been neither fever, vomiting nor constipation. On June 7 I opened the abdomen by splitting the right rectus muscle and removed nearly all the ascending colon, the caput coli and a number of inches of the small intestine, the measurement not having been reported to me. End-to-end anastomosis was effected by a Murphy button reinforced by sutures; the button was passed on the tenth day. Convalescence was smooth and the patient was discharged well on the twenty-first day.

CASE VII.—*Carcinoma of the Sigmoid*. Recovery. Mrs. S., age 50, entered the University Hospital February 3, 1905. About one year ago she began to feel weak, but nothing definite was noticed until an attack of severe pain in the right side occurred last spring, followed by a bloody mucous fluid which still continues to be discharged during evacuations of the bowel. Marked constipation developed, and the pain was now constant, extending down the left leg, but this had been absent until one week ago for three months. Examination of the abdomen revealed a tender mass in the left inguinal region unconnected with the uterus; it was irregular in contour and was slightly movable. The mass extended somewhat deeply into the pelvis. On February 20, 1905, I introduced my hand into the abdomen through an incision splitting the outer side of the left rectus, and found an inoperable malignant tumor of the descending colon inextricably fused with the adjacent parts. It was located too high for a colostomy, and it was desirable to avoid the discomfort of such an operation, so it was decided to make a lateral anastomosis between the splenic flexure and sigmoid portion of the colon, which was effected with some difficulty by means of a Murphy button reinforced by interrupted celluloidin thread sutures. Prompt recovery ensued, the button was passed on the

twelfth day and she returned home March 21, with relief of all her symptoms.

CASE VIII.—*Carcinoma of the Sigmoid.* Recovery. M. B., aged 55 years, entered the University Hospital September 14, 1904, having noticed some constipation since the previous spring. Ten days ago he had the last satisfactory movement of the bowels and one slight movement three days later, but some time during the previous Sunday he began to vomit a bitter material rather frequently, but since entering the hospital emesis occurred but once; the abdomen was considerably distended. Dr. Darling in my absence explored by a median incision but was unable to locate the site of obstruction on account of the great distention of the intestine. Accordingly he punctured a loop of the large bowel giving vent to much flatus, the opening then being closed with silk sutures. This procedure permitted access to the obstruction in the upper portion of the sigmoid but not enough for removal of the carcinomatous mass, so a colostomy was done without any effort to make a spur. Convalescence having been thoroughly established, after temporary suturing of the colostomy opening to secure asepsis, an incision to the inner side of the left rectus was made on October 6, 1904, when I resected without any special difficulty the carcinomatous mass, employing a Murphy button to reunite the bowel. At one point the transverse colon was firmly attached to the bladder, probably where the bowel had been punctured at the first operation to get rid of the distention; a small opening resulted, which was closed with celluloidin thread sutures. Convalescence was prompt and satisfactory, the patient leaving the hospital November 9, 1904, with a small fecal fistula alone representing the large colostomy opening; this opening was subsequently (January 28, 1905) cauterized with the Paquelin cautery, after which the opening quickly closed. Owing to carelessness the button was not detected in the stools, but repeated X-ray examinations show that the button has been passed.

This case illustrates several important points, viz., the occasional impossibility of primarily removing the cause of obstruction in the large bowel even when the condition of the patient permits of prolonged manipulation, because of the dis-

tention of the whole intestinal tract; the failure of puncture of the bowel to remove enough of the intestinal contents to be of service, while a colostomy will in time permit one to gain free access to an obstruction which originally seemed inaccessible; and the invincible tendency of an artificial anus to close if no spur is formed as soon as all stricturing of the bowel is removed.

This is the last case which I shall quote, although I could readily add to the list, but I think that single and double resections, side-tracking, temporary drainage of the bowel and permanent intestinal fistulæ, union by suture and by mechanical devices and omental grafts have all been illustrated, and that in principle the whole of the modern surgery of the large intestine has practically been covered by these cases.

In conclusion, let me emphasize a few facts, some of which are well known but which seem to be forgotten by many practitioners, the first being that neoplasms of the large intestine give rise for long periods to little beyond what is called constipation by patients, and attacks of cramping pains with some passing distention, and that this may be all that has been noticed when during operation, or at the post-mortem, the lumen of the bowel seems incapable of transmitting feces. Vomiting is a late or even absent symptom, but may suddenly supervene with all the symptoms of acute obstruction. If the diagnosis was made earlier than it usually is, resection with a real cure would be common, instead of these late and too often useless operations. We are too accustomed to disregard the possibilities of localized massive formations of tubercle with matting together of adjacent structures occasionally simulating malignant neoplasms, as seen in Case V; in a doubtful case tuberculin might settle this question. Again, the desirability of opening the intestine to produce sufficient collapse to enable the operator to deal radically with a stricture in the presence of acute obstruction is questionable unless by this device side-tracking by a lateral anastomosis be rendered possible between a loop above and below the obstruction, otherwise colostomy or enterostomy is the only proper operation; moreover, a bowel incision may lead to dangerous adhesions, for instance to the bladder, as in Case VIII. Too often the

attempt is made to eradicate malignant disease by free resection, when "side-tracking" would be equally efficient and productive of as much palliation as resection, with vastly less risk to life. Too much stress is laid by some upon the removal of the appendix and securing the opening into the bowel in all cases of perforation with pus formation. Although when this cannot be done death often follows, this result is more apt to be due to the precedent conditions, while occasionally a patient can be saved for a successful secondary operation by avoiding all primary radical measures, as in Case I. I can see no difference in the results between suturing and the Murphy button, provided care be taken in both instances to see that the portion of the large bowel uncovered by peritoneum has this membrane carefully drawn over the muscular coat by special sutures when the button is not used, or where this device is employed, by the over-and-over loop of the purse-string drawing both layers of the mesocolon together, as Murphy has so urgently directed, but which essential precaution is frequently neglected by other operators. The button usually takes less time to employ than suturing, although I rarely fail to pass reinforcing sutures, but for lateral anastomosis it is superior to suturing, while it can be successfully employed where sutures are out of court, *i.e.*, when one end or the ends of the bowel are bound down, thus preventing the free handling and ready access to all portions of the line of union so essential for securing suturing.

A METHOD OF PERMANENT DRAINAGE OF BOTH KIDNEYS THROUGH THE LOIN IN CONNECTION WITH BILATERAL NEPHROSTOMY.

BY FRANCIS S. WATSON, M.D.,

OF BOSTON, MASS.

Lecturer on Genito-Urinary Surgery, Harvard Medical School; Junior Visiting Surgeon to Boston City Hospital, Etc.

(An addendum to an article by the same writer published in the December number of the *Annals of Surgery*, 1905.)

IN the December number of the *ANNALS OF SURGERY*, there was published an article by me in which I endeavored to establish certain things in connection with a proposal to adopt a new and somewhat radical method for the surgical treatment of tumors of the bladder, the following being the more important of them:

1. That the operative treatment of tumors of the bladder had been hitherto far from encouraging in its results. The results were set forth in the form of an analytical study of a large number of cases reported by different surgeons of various countries, and were arranged with reference to the special kinds of operations that had been applied to the special kinds of tumors.

2. That the reasons for the unusually large proportion of failures which had attended the operative treatment were as follows: (a) The inadequacy of the less radical measures to the ends which they aim to secure, even in the cases of benign tumors. (b) The too-tardy employment of operative measures. (c) The failure and dangers of ureteral implantation.

The assertions were supported by data consisting of a large number of cases.

The following conclusions were expressed as those derived from the study of the subject:

1. That ureteral implantation should be abandoned as a means for diverting the urine in connection with total extirpation or resection of the bladder in cases of vesical or prostatic

tumors, and that permanent renal fistula established by lumbar nephrostomy (unilateral in case of resection of the bladder necessitating the division of one ureter; bilateral, when both are involved), be substituted for it, and that the renal operations shall be done as a preliminary step to the operations upon the bladder, the latter being performed at whatever time subsequent to the nephrostomy the patient's condition should have become good enough to have them undertaken.

In doing the nephrostomies, the ureters should be tied off as near as possible to the pelves of the kidneys.

2. That total extirpation of the bladder should be performed at as early a period as possible after nephrostomy had been done in all cases of malignant tumors of the organ in which the disease had not exceeded the limits of the bladder or prostate and seminal vesicles, and in which there was believed to be no metastasis present. This should be performed at the outset,—that is to say, it should not be preceded by some less radical measure in that class of cases, and the same should be done in all cases of benign vesical tumors which have occurred more than once.

The writer proposed to have this plan applied only to patients in good circumstances who could care for the renal fistulæ properly.

The dangers of nephrostomy *per se* were stated to be exceedingly small, and this assertion was supported by the results of a large number of cases in which the operation has been done.

The inconveniences and distress attending renal fistula the writer believed could be avoided if a proper provision was made for draining the kidneys through the loin. He cited one of his cases as an example of the successful employment of a simple and practical manner of arranging such apparatus, which was that of a man upon whom he had performed nephrostomy and established a permanent renal fistula on one side eleven years ago and who had had the same procedure carried out upon the second kidney by his colleague, Dr. Thorndike, upon the other kidney four years ago. This patient had worn the apparatus and passed all the urine for eleven years through the loin on one side, and during the last four years through the loin of both sides and from both kidneys. Not only had the operations in each instance saved the patient's life, but he

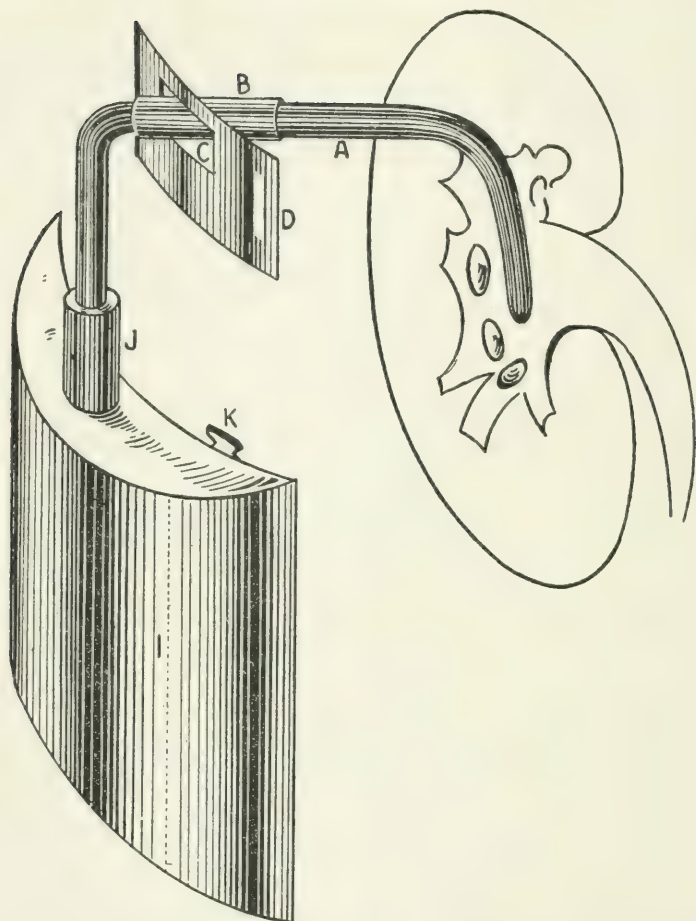


FIG. 1.—*a*, drainage catheter; *b*, rubber tubing which fits into orifice of fistula and is held by horizontal opening in shield *c*; *i*, flask to receive urine; *j*, nozzle of flask into which outer end of catheter is passed; *k*, ring used to attach flask to hook on waistband (fig. 3-*k*).

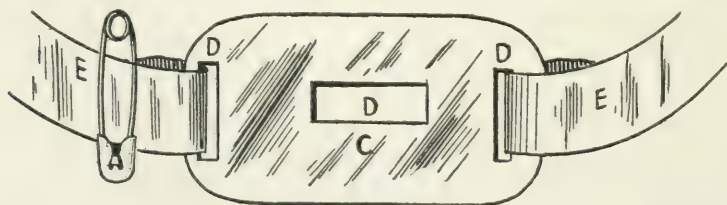


FIG. 2.—Shield with tape attached to the holes at its ends.—*c*, Shield; *d-d'*, openings for tape; *e-e*, ends of tape band which attaches the shield to the patient's back.

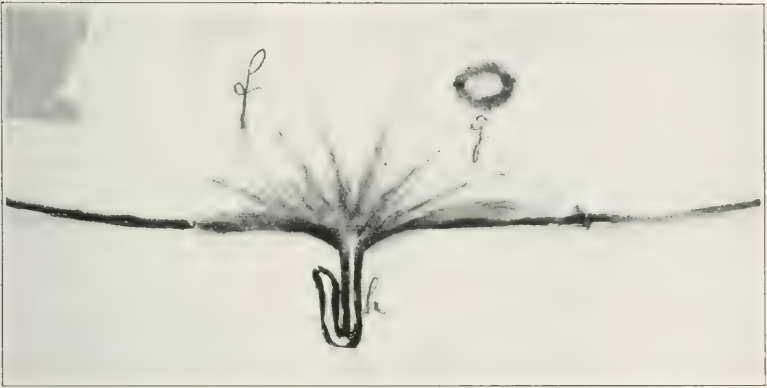


FIG. 3.—A bit of the waistband showing one of the hooks to which the reservoirs are attached and the hole through which one of the catheters is passed; *f*, waistband; *g*, hole for catheter; *h*, hook.

had been restored by them to entire health and to-day both kidneys are secreting approximately a normal amount of nearly normal urine. The patient is entirely comfortable; he is pursuing an active business life; not a drop of urine leaks around the drainage tube and consequently there is no odor and he is entirely dry. No one is aware of his condition. In short the patient's history subsequent to the operation shows that it is perfectly possible to so arrange drainage from permanent renal fistulæ as to secure for the patient health, comfort, active life and entire freedom from distressing conditions of any sort.

The apparatus by which this result has in this case been accomplished was not described in the writer's article published in the December ANNALS. A number of inquiries with regard to it have convinced him that it would be worth while to present it, with which intention the following description is given, with illustrations on opposite page.

The following articles compose the apparatus for draining the kidney. (In the illustrations, one of each of the different parts of the drainage apparatus only is designated, and is intended to serve as the example of all similar parts of it when these are duplicated for the double-sided drainage.)

1. Two red rubber drainage catheters. (Fig. 1a.)

2. Two bits of rubber drainage tube each two and a half inches long (more or less, according to the thickness of the patient's back), and of a size to fit tightly upon the catheters and in the horizontal opening of the shield through which they are passed. (Fig. 1b.)

3. Two hard rubber shields (Figs. 1 and 2c) about three inches in length, two inches wide, and curved to fit the back. There are three openings in each of the shields (*d*, *d'*, *d''*, Fig 2), two perpendicular and one horizontal; the latter should be a little narrower than the rubber tubing *b* in order that it may compress the tubing firmly enough to prevent it, and the catheter which passes through it, from slipping to or fro. The former are long enough to admit tapes an inch wide.

4. Two pieces of strong tape or elastic webbing. (Fig. 2e.) One end of this tape is attached to the outer of the two perpen-

dicular openings in the plate. The tape should be long enough to pass around the body and is secured in the opening at the further end of the shield by safety pin or other device as may be preferred. Elastic bands have the advantage, as compared with tapes, of adapting themselves to the movements of the body and thus keeping the shield constantly apposed to the back.

5. A waist band (Fig. 3*f*) long enough to go around the body and about four inches wide. This band should be of stout material; its front ends are brought together by a couple of straps and buckles; on the lower border of the back of the waist-band are attached four stout hooks, and there are two holes to allow the catheters to be led through the band. (Fig. 3 *g* and *h* represent the part of the band showing the hook and one hole.)

6. Two flasks, five inches long by four inches high by one and one half inches wide, curved to fit the gluteal regions; each having a nozzle projecting one inch above the middle of its top and just large enough to admit the ends of the catheters, and provided with a ring firmly soldered near either end of the inner side of the tops of the flasks. (Flasks, Fig. 1 *i*; nozzle *j*; rings *k*.)

The flasks may be made of hard rubber, aluminum or any other suitable material having a surface that will not absorb the urine.

Precautions to be observed in applying the apparatus.—Before placing the apparatus upon the patient the points within the kidneys from which the ends of the drainage catheters will best drain the organs should be determined, and the catheters marked at the point at which they emerge from the mouths of the fistulæ; this mark will serve as a guide to show how far the instruments should be passed in and also where to place the bits of rubber tubing upon them. The marks on the catheters should correspond to the middle of each bit of tubing.

One other precaution must be observed with respect to the places of the ends of the catheters in the kidneys, viz., *they must not cause pain to the patient.* This will be produced if the ends rest in the pelvis too near to outlet, and in my patient I have known a faulty position of the tubes call forth, though in a moderate degree only, the characteristic pain of renal colic.

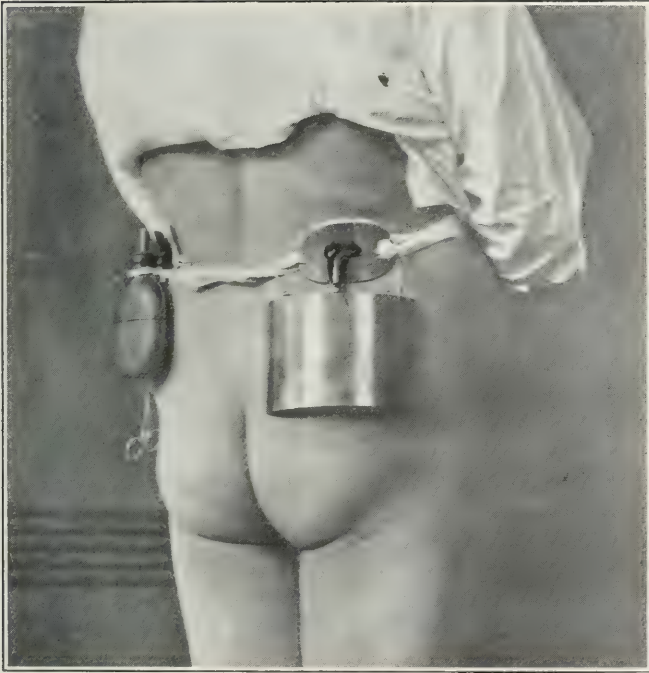


FIG. 4. - Urine receptacles adjusted to receive secretion from Kidneys.

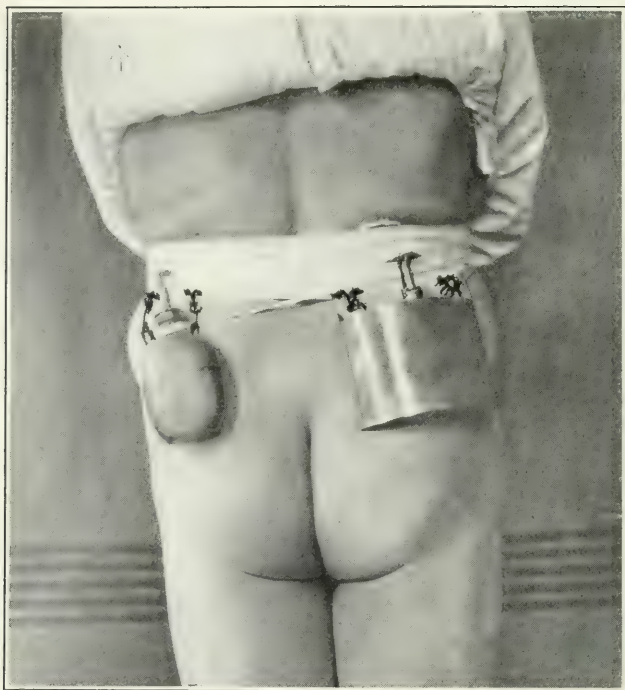


FIG. 5.--Urine receptacles adjusted to receive secretion from Kidneys; retention girdle applied.

In what follows with regard to the manner of applying the apparatus, it is referred to as though but one side was to be drained, in order to make the description simpler and more readily understood.

Enter the catheter, with its bit of rubber tubing properly placed upon it, into the fistula until one-half of the tubing lies within the mouth of the tract.

Put the outer end of the catheter through the central opening in the shield and push the latter along the catheter and bit of tubing until it lies against the surface of the back. Then pass the free end of the tape (or elastic band) belonging to the shield around the waist and through the perpendicular opening in the other end of the shield and attach it securely there.

The catheter is thus securely fixed in place so that it cannot be moved either inward or outward, as is shown on the right side of the back in Fig. 4.

Attach the waist band to the patient, passing the catheter through the opening in the back of it made for that purpose.

Fasten the reservoir (flask) upon the waist band by passing the hooks upon the latter through the rings upon the upper edge of the former, and insert the end of the catheter into the nozzle of the flask (Fig. 5).

When it is necessary to empty the flask, the patient can readily detach it himself.

Every night the catheter which has been worn through the day is replaced by another, which should be boiled for fifteen minutes previous to its being used. The night catheter is replaced in the same way by the other in the morning. When this is done, the kidney and the fistula should be irrigated gently with warm sterile saline solution, permanganate of potash (one part to 5000 of water) or other bland cleansing fluid that the surgeon may prefer. The flasks should be boiled once every twenty-four hours, and thoroughly washed out at least once besides in each day.

This is the form of apparatus which has been employed by me in the case of the patient referred to earlier in the communication, and with which he has been perfectly satisfied and comfortable. It requires care and attention to keep it clean,

and must be placed upon the patient properly if it is to answer its purpose. In considering the trouble that there is in taking care of such an arrangement it should be remembered that the conditions under which it would be employed are, or rather have been, desperate and if, after life has been saved by operative intervention, an apparatus can be devised whereby the patient is rendered entirely comfortable, as was the case in this instance, the matter of its being more or less troublesome to apply and to keep in proper condition is of very little importance in view of the benefits that have been obtained and the comfort and good health of the patient that have been secured.

The means by which the kidneys were drained in this case is only one of a number by which the same end might be attained, nor is it, in the writer's judgment, the most convenient form of apparatus that could be used for accomplishing it, but having had practical experience with this one, it has seemed better to describe it.

CONTRIBUTION TO THE SURGERY OF THE KIDNEY.¹

CASES REQUIRING NEPHRECTOMY.

BY GILBERT BARLING, M.B., F.R.C.S.,

OF BIRMINGHAM, ENG.,

Professor of Surgery in the University of Birmingham; Surgeon to the Birmingham General Hospital.

CASE I.—*Renal Mobility with Tumour (Hypernephroma) causing Pyloric Obstruction; Nephrectomy, with relief of symptoms.* A lady, aged 50, consulted me on March 1, 1905, for pain in the right side of the abdomen and extreme constipation. For four years she had been a complete invalid, unable to do any work, even such as the supervision of her house involved, and during the last few months of that time she had practically been confined to bed and only able to take fluid diet and semi-solids. Even with this extreme care in dieting she occasionally vomited, and the consumption of solid food practically always gave rise to vomiting. Rest in bed made the patient feel more comfortable, but even then indigestion was very troublesome and she had lost weight to an extreme degree.

On examination it was found that the stomach was dilated and proptosed; the lower border on distension reached nearly three inches below the umbilicus; no peristalsis could be observed or elicited. There was a rounded mass in the right loin, which appeared to be continuous with the lower end of the right kidney, from which it could not be separated, the kidney was almost entirely below the costal arch, was freely movable and could be pushed bodily upward with the tumour, but it could not be completely replaced in the loin.

It seemed doubtful whether the patient was the subject of an actual stenosis of the pylorus, or whether the displaced kidney and the tumour attached to it interfered mechanically with the pylorus and duodenum by dragging on these structures. To

¹ Read at the meeting of the Midland Medical Society, December 6, 1905.

enable one to deal with any condition present it was decided to open the abdomen anteriorly rather than to attack the renal tumour from the loin.

Operation by incision through the right rectus. The pylorus was not stenosed, as the index-finger could be invaginated through it. The peritoneum was therefore divided over the right kidney to the outer side of the colon, and it was then found that there was a rounded elastic mass about the size of an orange connected with and partly enveloping the lower end of the kidney. (Fig. 1.) The nature of the tumour was doubtful, and as it might prove to be malignant it seemed better on the whole to remove the kidney and tumour together rather than to do resection of the kidney. Palpation of the left kidney showed that it was a healthy and well-formed organ, and nephrectomy was therefore performed. The tumour was found to be closely associated with the second part of the duodenum; so closely, in fact, that the outer coats of the intestine were injured and required suturing.

A good recovery followed the operation and within three weeks the patient was able to take solid food, meat and vegetables, in carefully administered quantities.

I have not seen her since she left the Nursing Home, but on inquiry by letter learn that she is immensely benefitted, though she still gets indigestion and flatulence; she has gained weight and is able to get about and do a certain amount of work, and she speaks of "her wonderful health in comparison with that of the last few years."

The inability of the stomach to discharge its functions and the resulting wasting may have been brought about either reflexly by the weight of the kidney and tumour dragging on the renal plexus, especially in the vertical position, or by kinking of the duodenum from the sagging downward of the tumour, which was closely attached to the second portion of the bowel. On the whole I am inclined to regard the second explanation as the correct one.

The association of renal mobility with dilatation of the stomach is not rare, and the question often arises, are these two displacements simply the results of a common factor, or

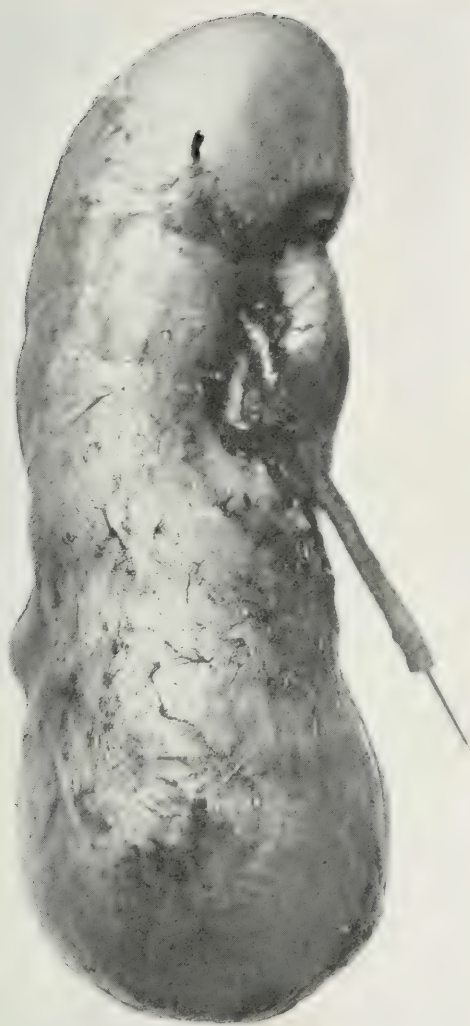


FIG. 1.—Showing the kidney unopened with the tumor at the lower end.

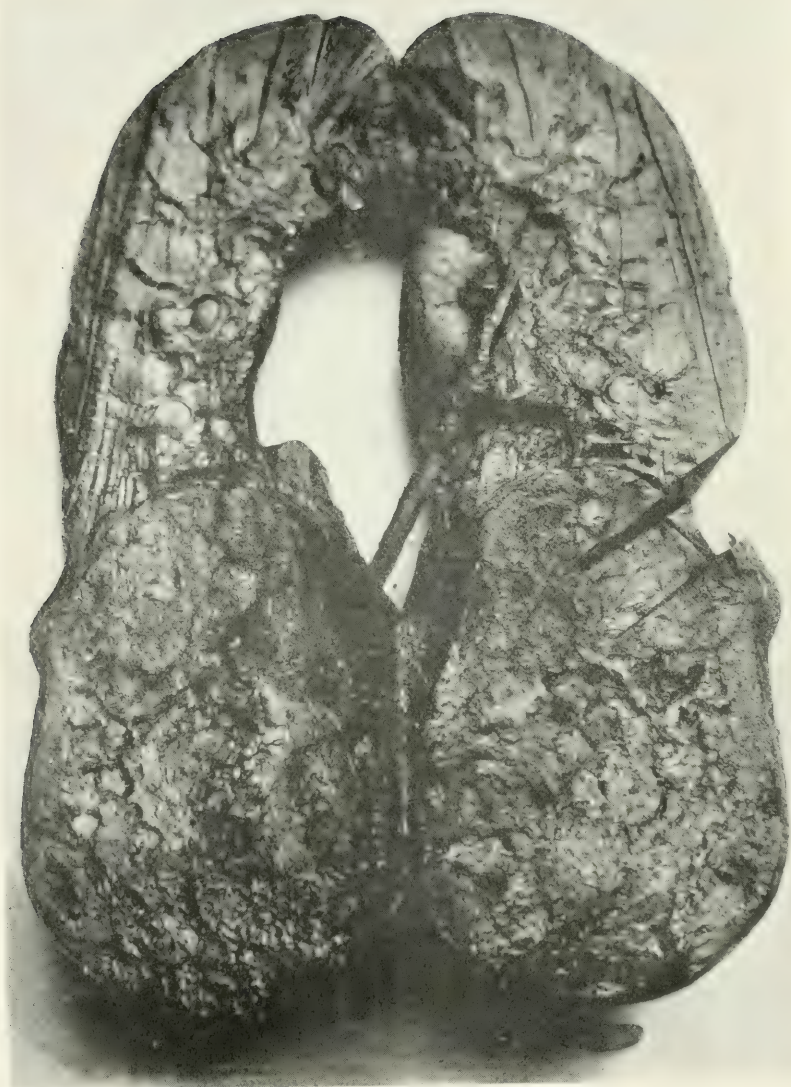


FIG. 2.—Showing a section of the kidney and growth.

does the first stand in causal relation to the second? The symptoms present are often those of neurasthenia, with vague pains and discomforts and stomach indigestion. Are the symptoms due to the descent of the kidney, or is the stomach to bear the onus of them? The answer is often difficult, but the case just related appears to shew that the drag of an unusually heavy kidney may be sufficient to interfere mechanically with the emptying of the stomach.

The removed specimen is in the Museum at the University, and I have to thank Dr. Hewetson, curator of the surgical portion, for the following account of the pathology of the tumour and for the photographs which illustrate it.

REPORT.—The tumour is situated within the capsule of the kidney and occupies the lower half of the entire organ. (Fig. 2.) It is roughly pear-shaped, the apex being uppermost, and has the following dimensions: Length (vertical) 8 cm., breadth (lateral) $5\frac{1}{2}$ cm., thickness (antero-posterior) 6 cm. The growth is definitely circumscribed by a dense fibrous capsule which separates it clearly from the kidney tissue above. The tumour substance resembles in appearance that of a deciduoma malignum, and consisted when fresh of a maroon-coloured spongy tissue with small areas of a firmer pinkish medullary tissue.

There are no visible trabeculæ passing from the capsule into the interior of the growth, and it can be stripped away from the capsule without much difficulty.

The naked eye appearances are those of a localised tumour beginning in the kidney tissue and presenting extensive areas of necrosis, or of old blood extravasation. The kidney tissue above the tumour, measuring about $8\frac{1}{2}$ cm. in length, is to all appearances healthy. The capsule of the kidney can be readily stripped from the renal parenchyma, but is very adherent to the tumour.

The ureter is normal, the renal pelvis is slightly dilated. The renal vessels exhibit no special peculiarity.

Microscopical Characters.—A section was taken opposite the upper part of the tumour, involving an area equal to about one-third its diameter. Externally there is a dense capsule consisting of concentric layers of fibro-muscular tissue; within this are layers of fibrous tissue in whose meshes are flattened kidney

tubules representing the kidney tissues which had become flattened and attenuated by the slow expansion of the tumour. Within this again is a further concentrically-arranged fibrous layer representing probably the capsule proper of the tumour. From this layer very delicate septa pass into the soft substance which comprises the new growth. This consists mainly of masses of old blood-clot shewing red corpuscles, white corpuscles and granular debris. The pinkish islets of tissue previously mentioned indicate the real nature of the growth, and this consists of epithelial cells cubical or polyhedral in shape arranged as delicate papillomata. (Fig. 3.) Each papilloma consists of a thin stem of areola-fibrous tissue covered by a single layer of cubical or polyhedral cells containing clear transparent protoplasm and a well-stained nucleus situated about the middle of the cell. (Fig. 4.) The delicate papillomata are arranged in a complex dichotomous manner. The tumour is very vascular, being supplied with large thin walled sinuses within the substance of the tumour and by large thick walled vessels within the meshes of its fibrous capsule. There is evidence of extensive extravasation, which cutting off the blood supply from large areas of papillomata, these have become degenerate and necrotic. There is no evidence of cyst formations within the tumour.

It would appear that this type of tumour, though moderately well known to pathologists, is little if at all known to surgeons. It has previously been regarded as adenoma, lipoma, angioma, endothelioma and carcinoma of the kidney. In 1883 Grawitz asserted that this type of growth was developed from misplaced portions of suprarenal tissue, and not from uriniferous tubules or the endothelium of lymphatics.

This view of Grawitz is generally accepted now and the tumour has been called by such names as Hypernephroma and Struma suprarenalis.

A critical review of this type of growth was given by A. O. J. Kelly (*Phil. Med. Jour.*, July 30 and Aug. 6, 1898); they are always soft and marrow-like and invariably definitely encapsuled. Occasionally they grow to a considerable size. They rarely produce hæmaturia; they are prone to interstitial hæmorrhages; they occasionally shew malignant characters,

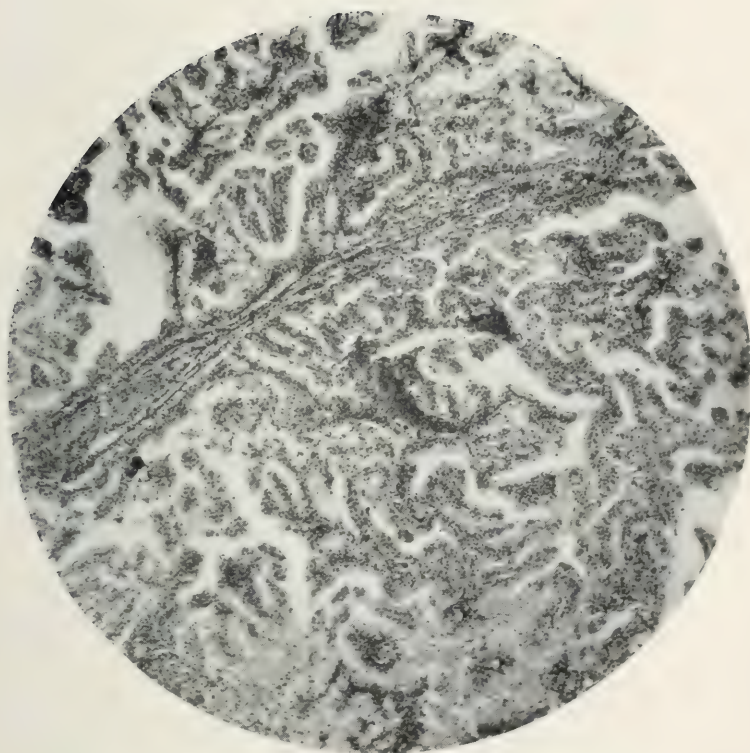


FIG. 3.—Showing the complex dichotomous branching of the papillomata.

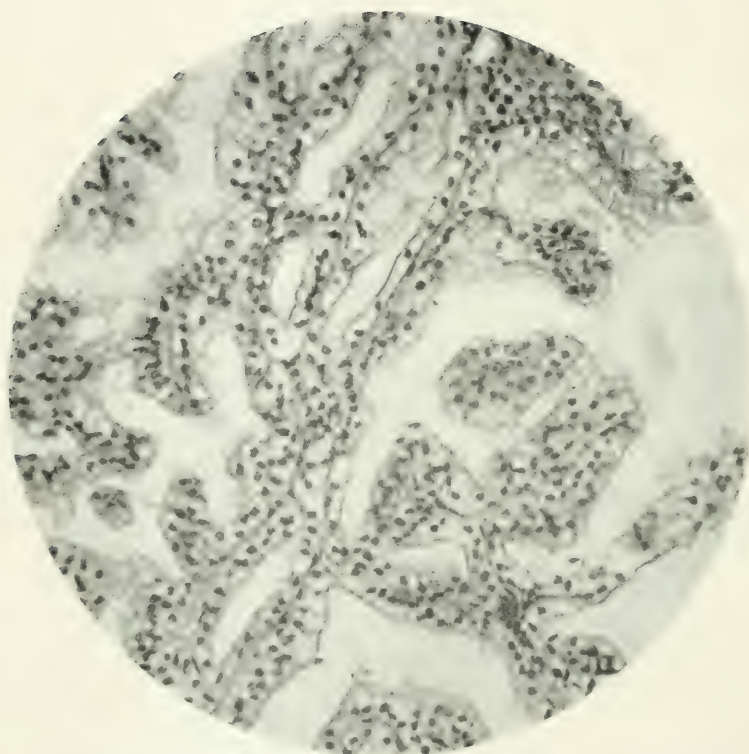


FIG. 4.—Showing the character of the epithelium covering the slender papillary growths.

giving rise to metastases in lung, liver and bones. Nearly all the reported cases have occurred in men and women between 40 and 50.

The next case is also one of great interest both from the clinical and the pathological standpoint.

CASE II.—*Pyelo-nephritis and Ureteritis of uncertain nature. Nephrectomy.* Recovery. A male, aged 26, was admitted to the General Hospital in May, 1905, for pain in the left loin and down the course of the ureter. For some twelve years the patient had suffered discomfort in the penis after micturition, the urine being generally turbid. Six years ago this inconvenience became worse, pain in the back was complained of, the urine became more turbid and a deposit of mucus was noticed in the chamber. Still later pain was complained of in the upper part of the thigh. All these symptoms were present at the time of admission, but were none of them very acute, though from time to time they caused the patient to rest from work for a day or two. No enlargement at the kidney could be felt, but there was tenderness over the organ. Examination of the urine shewed a small quantity of pus but no blood crystals or tubercle bacilli. Cystoscopic investigation failed to shew any condition in the bladder which might explain the symptoms; the left ureteral orifice did not appear to differ from the right.

The patient was again admitted to hospital in September, 1905, with all his symptoms worse, willing now to submit to operation, as his disablement was increasing and he had not been able to work at all for some weeks. The urine at this time was acid, it contained pus, but blood crystals and tubercle bacilli were still absent.

Operation.—The left kidney was exposed by the usual oblique lumbar incision; its pelvis was found to be dilated and much thickened but no calculus could be discovered. The ureter was then examined and found to be densely thickened and enlarged nearly to the size of the little finger at its upper part, gradually diminishing in size toward the bladder, though it was still unhealthy to within an inch of the organ. The diagnosis appeared still to be tubercular disease. The peritoneum was opened at the bottom of the wound and the hand passed across determined

the presence of the right kidney, which appeared to be free from any gross change. Nephrectomy and complete ureterectomy was therefore performed, as any less procedure did not promise to restore the patient to active work as a coach finisher. An easy recovery followed the operation and the patient is now well.

The method of examining the opposite kidney before proceeding to nephrectomy is one which is no doubt often resorted to by other surgeons, but it appears worth while calling attention to it, as it may not be generally practised. Complete ureterectomy was effected simply by enlarging downward and forward the lumbar incision, a method by which I have been able also to remove a calculus impacted in the ureter close to the bladder without making a second incision in the iliac region. In my experience there is scarcely any limit to what may be done in the way of removal of huge enlargements of the kidney and the ureter through this prolonged lumbar incision. If need be there is ample evidence in some of the cases I relate here of the wisdom of keeping kidney operations retroperitoneal rather than intraperitoneal whenever this can be done.

Pathological note and photographs of the specimen by Dr. Hewetson.—The capsule of the kidney is thickened but strips without much difficulty, the kidney pelvis is dilated and its walls thickened and indurated. The ureter has the calibre of a cedar pencil and possesses thickened walls. On section it is readily seen that the chief seat of the trouble lies in the pelvis and ureter; both are lined by a whitish granular layer, which largely accounts for the thickening and induration of their walls. No calculus can be discovered. The kidney tissue is of a pale pink colour and cuts very much like that of a lardaceous kidney, although there is no characteristic stain if iodine is applied. The cortex is not altered in size; the medulla is somewhat congested. There are no abscesses visible to the naked eye within the kidney tissue. At one or two points the granulation tissue lining the smaller divisions of the kidney pelvis appear to have burst into the medulla of the kidney and formed very small abscesses there. At the upper pole of the kidney there are one or two shrunken areas of kidney tissue shewing a brownish red colour on the sur-

face; these are probably either of a thrombotic or infarctic nature. The blood-vessels of the kidney are normal.

Microscopical.—The kidney tissue everywhere shews advanced parenchymatous nephritis, with destruction of glomeruli and kidney tubules over extensive areas. This destruction is due no doubt to the infiltration of the interstitial tissue with small round cells which are diffusely arranged in both cortex and medulla. This inflammatory reaction is widespread and not arranged in tubercle formations.

The kidney pelvis and ureter are enormously thickened, this being due almost entirely to an inflammatory change in the mucous and sub-mucous coat. This consists of the breaking up of a thick layer of round cells chiefly of a mononuclear variety, which either lie in the sub-epithelial layer or entirely replace the epithelial cells. There are no giant cells anywhere and no suggestion of tubercle formations.

The nature of the pathological process is probably that of a sub-acute inflammation arising in the pelvis or ureter of the kidney and which has gradually spread to the kidney tissue. From the histological character of the sections of kidney tissue, pelvis and ureter, one would infer that this is probably an inflammatory process of a simple pyogenic nature and not of a tuberculous one, although no cause such as calculus was found to originate the condition.

CASE III.—*Intermittent Hydro-nephrosis with extreme mobility of the kidney. Nephrectomy.* Recovery. This specimen was removed from a lady, 35 years of age, who had since early childhood suffered from attacks of pain in the right side of the abdomen and the right loin, pain which at times was very severe and caused vomiting and which for some years had been associated with a swelling in the right anterior renal region, the swelling from time to time subsiding with an increased excretion of urine which occasionally would be coffee-coloured, suggesting that there was blood in it. When I first saw the patient she had a swelling as large as a child's head, entirely below the costal arch on the right side and reaching back into the loin; it was fluctuating and freely movable, both vertically and laterally.

Operation by the usual oblique lumbar incision. After pal-

pating the left kidney in the manner I have already described and finding it plump and healthy and not unduly movable, the right kidney was removed, as it was found that the kidney tissue was reduced to a mere shell; there was hardly anything but the capsule left. The attachment of the ureter to the kidney pelvis was such that an incomplete emptying of the pelvis must have been habitual. It is of course in this case impossible to say whether the mobility was the first fault which so kinked the pelvis and ureter as to cause distension of the organ, or whether some congenital fault in the attachment of the ureter to the kidney pelvis was the first cause of the hydronephrosis and the intermittent emptying of the organ produced displacement of structures around and secondary mobility. I incline to think that the mobility of the kidney was the first step in the destructive processes that had gone on. Certainly this is so in some cases, of which the following is an example:

A year ago a lady, aged 45, was sent to me by Dr. Roberts, of Dursley, with a history extending over thirteen years, of pain in the right side of the abdomen which came on after an acute illness. Ever since that illness from time to time there had been pain in the right side of the abdomen and the right loin; the pain was made worse by exertion, and it was also especially bad when the patient was tired; occasionally vomiting was associated with the pain. At times micturition was very frequent, and at others the patient was unable to pass urine without great difficulty. On examination the right kidney was found freely movable either in the recumbent, lateral or vertical positions; the left kidney could not be felt.

I performed nephropexy by the method I generally adopt, a modification of Goelet's, and found a considerable degree of hydronephrosis, so that nearly half the kidney tissue was destroyed; there was an abnormal renal artery at the lower pole of the kidney.

During the first few days after the operation there was great discomfort and dysuria. These symptoms were so severe that it appeared doubtful whether nephrectomy would not be required, but the acuteness of the symptoms gradually subsided, and when the patient got up at the end of four weeks she was perfectly comfortable and has remained so ever since.

A year after her operation she reported herself as feeling strong and well, and able to walk four or five miles without difficulty. She and her husband stated that the improvement in her health since the operation was marvellous; that she was now able to undertake duties which before were quite impossible for her; that her life was not only more comfortable but that mentally she was quite different, bright and happy, instead of being depressed and morbid.

I mention this case to shew that mobility may be an efficient cause of hydronephrosis and that fixation of the movable organ may suffice to prevent further deterioration of the kidney and at the same time give relief to the distressing symptoms.

The earlier part of this year I was consulted concerning the wife of a medical man who was very seriously ill from a right-sided pyonephrosis, associated with mobility of the right kidney. It appeared to me from the history in this case that there was some hydronephrosis due to movement and that infection invaded the distended organ, setting up an acute pyonephrosis. Happily the purulent collection eventually discharged itself down the ureter and the urine became almost, but not quite, free from pus after prolonged rest and treatment. Further examination of this patient shewed that both kidneys descend freely when she is in the upright position, and a past history of many years of indifferent health, weakness, exhaustion, and inability for a really active life points strongly to the mobility of her kidneys as the cause of her incapacity. Some three months ago I ordered her a double truss support to keep the displaced organs in position, and she is one of the fortunate patients who has derived very great benefit from this measure for she writes me, within the last few days, that her life is quite different since she has had the benefit of the instrument, and that she is now able to undertake duties that were before quite impossible for her.

I mention this case in conjunction with the preceding ones to point out one of the dangers to which patients with hydronephrosis are exposed, viz., to infection of the dilated

tract and resulting pyonephrosis, and I will illustrate this by referring to two other cases which possibly arose in this way.

The two cases next reported are both examples of unilateral pyonephrosis, which appear to have arisen without the provocation of *calculus or tubercle*. Case IV. was probably due to some congenital defect or displacement, for in this instance there is a long-continued history, beginning in young childhood, of attacks of pain in the left renal region associated at times with vomiting. In all probability hydronephrosis was set up which eventually became infected, pyonephrosis resulting. When the patient came under observation he was most gravely ill and the diagnosis, between an acute thoracic and acute abdominal condition, was very difficult. At this time he was far too ill to permit of any operative interference whatever the diagnosis might be, and it was hoped that by withholding operative interference he might struggle through to a more favourable period. This fortunately happened and it became clear that the condition was located in and around the kidney.

In Case V. there was a marked contrast to the very acute and severe illness of the case just mentioned.

This patient was in comparative health and the renal swelling was discovered almost accidentally when he was still following his occupation and apparently without much inconvenience. Neither in the history nor in the removed specimen is it possible to trace the provocative conditions which set up pyonephrosis, but I suspect that in many of these unexplained cases there is in the first instance hydronephrosis either from mobility or from some malformation about the ureter or kidney pelvis.

CASE IV.—*Huge Pyonephrosis and Pyonephritic suppuration with acute symptoms, partly abdominal, partly thoracic. Lumbar Nephrectomy.* Recovery. A male, aged 25, was admitted to the General Hospital under the care of Dr. Simon, September 7, 1905, complaining of severe pain in the left side of the chest and abdomen.

On the day of admission the patient had an attack of acute pain in the left side affecting the back, extending round to the

front of the abdomen and involving the lower part of the left chest where there was severe stabbing pain, worst on deep respiratory effort. When I first saw him the patient was extremely ill; pulse 140; temperature 102; respirations 44. The belly was rigid, the thoracic movements were slight and mainly of the upper part. The diagnosis was uncertain whether acute abdominal lesion or pneumonia with latent physical signs. The history that ever since five years old the patient had suffered acute attacks of pain in the left loin suggested that a plugged kidney with distension and infection spreading from it was the probable cause of the present illness. The delay of a few days materially cleared up the diagnosis; a few blood cells were found in the urine on two occasions; the pain and tenderness became more definitely localised over the left kidney; a large mass could be felt occupying the left lumbar region; the pulse fell to between 80 and 90; the temperature also falling somewhat and becoming of the hectic type.

Operation.—Lumbar incision liberated a perinephritic abscess of some ounces and the kidney was found hugely dilated and extending up to the left arch of the diaphragm above and to the crest of the ilium below. It was shelled out without much difficulty, the vessels and ureter were ligatured separately. A bougie was passed down the ureter into the bladder and the tube was found patent. A good recovery followed.

Examination of the specimen shewed that the whole of the renal tissues were practically destroyed, the distended parts being filled with pus, and there was no evidence of calculus or tubercle to explain the condition found.

CASE V.—*Large Pyonephrosis simulating a Hepatic Tumour. Nephrectomy by abdominal incision.* Recovery. A male, aged 35, was admitted to the General Hospital on September 11, 1905, with a large abdominal tumour reaching from the right costal margin to the iliac fossa and extending laterally from the right side of the abdomen to some inches beyond the middle line. The swelling was very slightly tender, doubtfully fluctuating; it was mobile laterally, and descended somewhat on inspiration. There was stomach resonance over the inner and upper part of the swelling, colon resonance over the front of it could not be made out distinctly, and on palpation the hand could not separate

the upper margin of the swelling from the liver. Bimanual palpation shewed that the swelling did not occupy the lumbar space as fully as was to be expected from renal enlargement. There was no history of any recent inconvenience from the swelling, but the patient stated that he had suffered pain in the right loin three years previously and that his urine was turbid then. Examination of the urine shewed a very few pus cells and the excretion of urea was something under 300 grains.

Operation.—Although there were some points suggesting that the tumour was renal, in view of the uncertainty of the diagnosis an incision was made over the front of the abdomen, when it was found that the tumour was free from the liver and that it was connected with the right kidney. Part of the swelling was fluctuating, but a great deal of it appeared to be solid. The peritoneum over the swelling was opened to the outer side of the colon, the colon and duodenum were stripped off the front and inner side and pushed toward and beyond the middle line. During this manipulation a small collection of pus was liberated. As the stripping proceeded it was found that the innermost part of the swelling was closely adherent to the inferior vena cava, which was separated with great difficulty but without a catastrophe. The renal vessels were ligatured separately, the parts were restored to their natural position and the cavity left was drained by lumbar puncture and the anterior wound entirely closed. Some large lumbar glands were removed, there being suspicion that the condition was really one of pyonephrosis with malignant growth.

The report on the specimen by the pathologist, Dr. Sawyer, shewed that the condition was one merely of pyonephrosis with great thickening in parts of the capsule of the kidney, and the lymphatic glands were also shewn to be free from growth. There was no evident cause such as calculus or tubercle for the condition found.

CASE VI.—*Pyonephrosis with large perinephritic suppuration due to renal calculus. Nephrectomy.* Recovery. A male, aged 58, was admitted to the General Hospital on October 7 with a large abdominal tumour on the left side which had been discovered recently, the man seeking advice because of a feeling of stiffness on the left side which caused him some inconvenience

when at work. The left side of the abdomen was occupied by an elastic swelling, which extended from beneath the costal arch down into the iliac fossa; it reached to the middle line and filled the left lumbar space. The swelling was not tender and was doubtfully fluctuating. The time at which this swelling developed was quite uncertain, for the patient practically knew nothing of it, but he stated that twelve months before he came under observation he had suffered severe pain on the left side of the belly when he was in bed one morning and was sick for about twelve hours then. Since that time he has had what he calls a feeling of bubbling in the left renal region pretty often. The patient states that he has noticed his urine thick and cloudy for the last forty years, and he thinks that at one time he passed blood in it after cycling; he also noticed that he passed urine rather frequently during the day but not so frequently when at rest. He was a well-nourished and muscular man, but his surface arteries were much thickened and tortuous. The examination of the urine shewed constantly the presence of pus and there was a good excretion of urea, amounting to about 300 grains, on a light diet. The diagnosis appeared to be pyonephrosis, probably from plugging by a stone, and nephrectomy was advised.

Operation, October 16, by a prolonged oblique lumbar incision, which opened a perinephritic suppuration estimated at about two pints, the pus being of a peculiar mucus sticky feel but without odor. The kidney was then defined and after much trouble a line of cleavage was obtained, but in the process of stripping the organ the peritoneum was widely opened and it was with much difficulty that the descending colon could be separated from the front of the kidney; indeed it was feared that some of its vessels had been disturbed, but subsequent events shewed that this was not so. It was impossible to suture the opening in the peritoneum so the wound was partly sutured and partly packed with gauze; this latter precaution was especially taken in view of the possibility of necrosis of part of the colon wall from the disturbance it had suffered. Happily the wound healed without any trouble whatever, the bowel remained sound, and the patient was discharged on November 10.

The kidney was widely dilated and practically no renal tissue was left; the dilatation was found to be due to a calculus in the pelvis.

A NEW METHOD OF EXCISION OF THE KNEE WITHOUT OPENING THE JOINT.¹

BY CARLETON P. FLINT, M.D.,

OF NEW YORK,

Attending Surgeon to the Lincoln Hospital; Chief of Surgical Clinic, Roosevelt Hospital, Out-Patient Department; Instructor in Surgery at the College of Physicians and Surgeons of New York City.

From the Surgical Department of the College of Physicians and Surgeons of Columbia University.

EXCISION of the knee for tuberculous disease is an operation associated with numerous disadvantages.

Tuberculous material is smeared more or less over the wound; often an unavoidable occurrence, which becomes especially dangerous should there already exist some secondary infection at the time of operation. The danger of tuberculous infection of the wound needs but to be mentioned; neither is it necessary to emphasize what the effects of secondary infection might be.

The diseased synovial membrane and other joint structures are frequently extremely vascular, so that the act of excising these tissues is sometimes combined with annoying hemorrhage. The perpetual clamping of small bleeding points prolongs an operation which even under the most favorable circumstances demands considerable time. One does not like to use a tourniquet for any length of time, because of the effect on the nerve supply of the leg and the related subsequent oozing, often very annoying.

This time element is quite important in cachectic and feeble patients.

Any method of resection which depends in part for its success upon complete removal of all diseased tissue after opening the joint is occasionally going to fail because some small

¹ Read before the New York Academy of Medicine, Surgical Section, December 1, 1905.

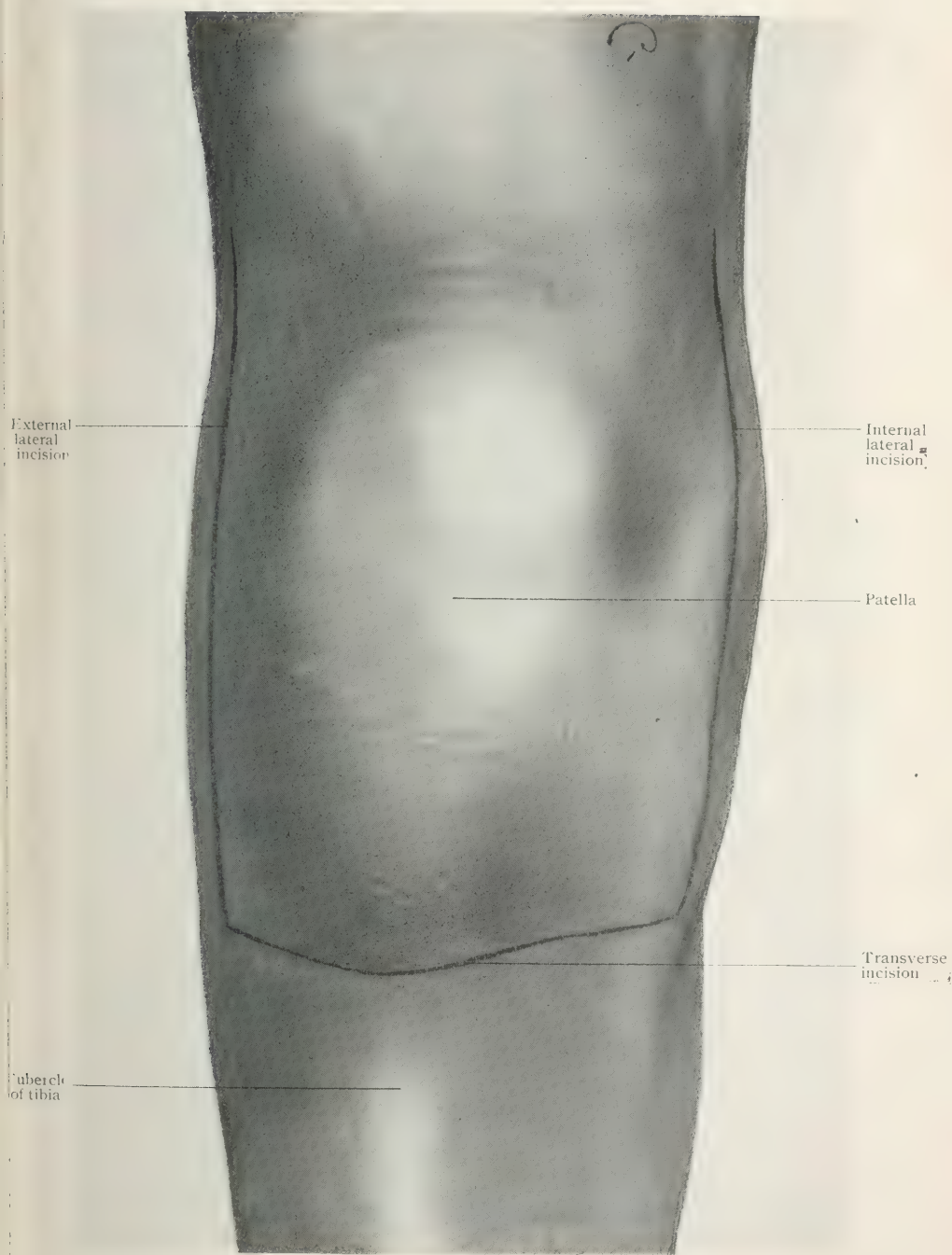


FIG. 1.—Showing square skin incision.

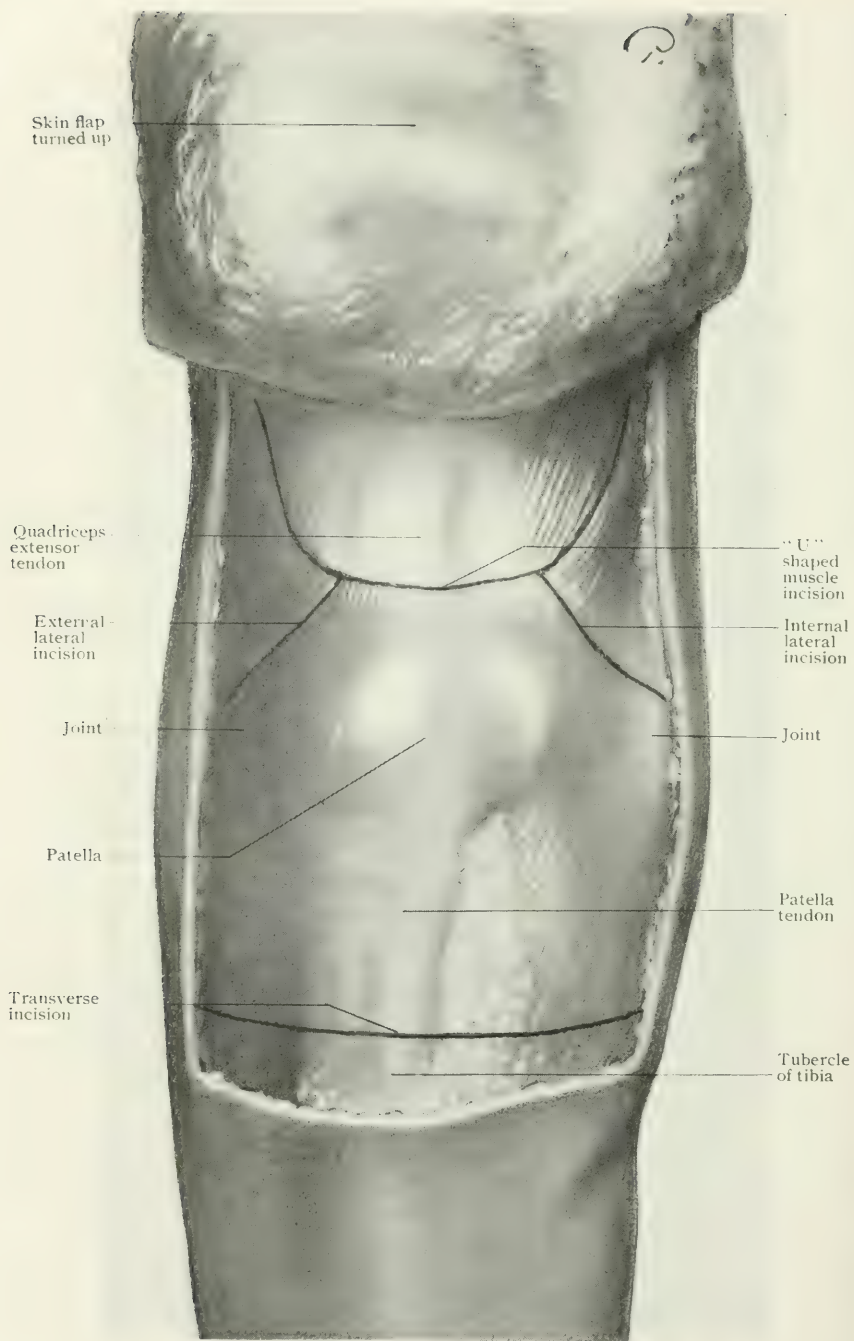


FIG. 2.—“U” shaped incision in quadriceps extensor. Internal and external lateral incisions in fascial expansions of quadriceps. Transverse incision over head of tibia.

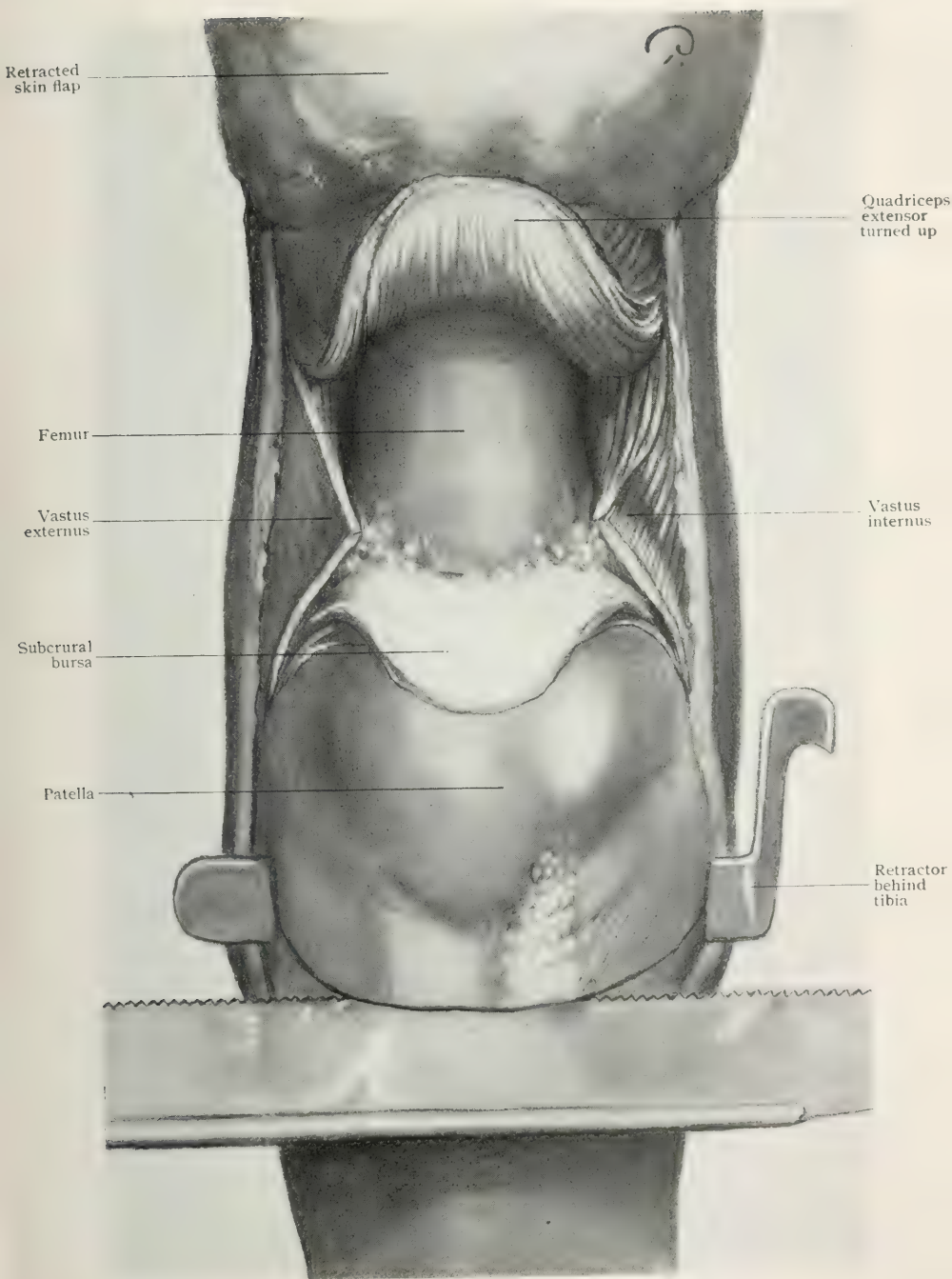


FIG. 3.—Muscle incisions. Bursa turned down. Retractor in place. Saw cutting tibia.

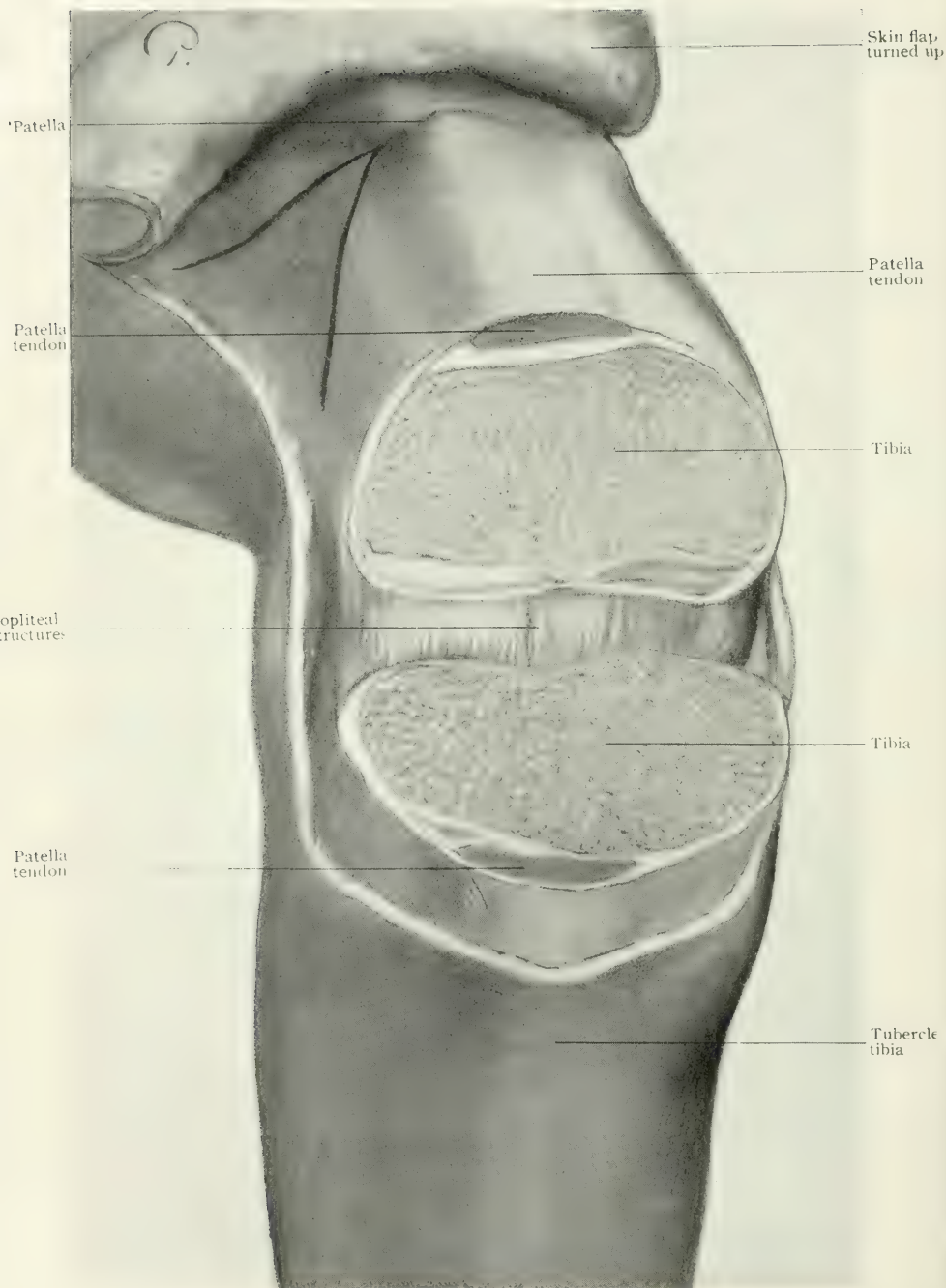


FIG. 4.—Tibia sawn through. Leg flexed. Structures at knee above fallen into place.

portion of the joint not removed serves as a starting point for fresh ravages of the disease. Kocher's method does not open the joint, but is subject to the other disadvantages.

It has seemed desirable to the writer to perfect some technique which did not open the joint and which would do away with the above-mentioned annoyances, and at the same time combine the advantages both of operations which do open the joint and of Kocher's method. It is my opinion that the following operation fulfils these requirements:

The skin incision should be rectangular, the two vertical cuts being well back at the sides of the leg, extending from a little above the level of the upper limit of the subcrural bursa to one inch below the joint line. These two vertical incisions are connected across the front of the tibia by a transverse incision (Fig. 1). This rectangular skin flap with the subcutaneous tissue is reflected upward.

The next incision is curved, the concavity upward. It starts in the vastus internus a little above the upper limit of the subcrural bursa and is carried down and outward in the direction of the muscle fibers to the tendon of the quadriceps extensor one-half inch above the patella, and from here upward and outward in the direction of the fibers of the vastus externus to a point corresponding to the beginning on the inner side. The muscle with the tendon is completely divided and turned upward, thus exposing to view the subcrural bursa. We next make two small incisions on either side of the femur, starting on each side of the patella in the incision just described, and carried downward and backward to the joint line. The one on the inner side divides the tendinous expansion of the quadriceps, the one on the outer side the tendinous expansion and part of the iliotibial band. After completing these incisions the subcrural bursa is separated from the femur with the knife and turned down, tilting the patella when not adherent. The last incision in front is carried transversely across the front of the tibia down to bone just below the joint line (Fig. 2).

On the inner side the sartorius and gracilis are pushed back; on the outer side the biceps and peroneal nerve.

A flat retractor about one inch wide is now introduced on the inner side behind the head of the tibia close to the joint line. It is first introduced vertically between the gracilis and sartorius on one side and the tibia on the other. These muscles are pried off and the retractor brought to a horizontal plane, the apex passing behind the tibia. This retractor is now pushed outward always close to the bone until it emerges at the outer side. All soft parts are thus held back.

The next step is to saw through the tibia as close to the joint as circumstances seem to warrant, the leg being still flat on the table; the retractor being in place protects the soft parts (Fig. 3.)

The saw-cut through the head of the tibia is used as a joint. The femur is flexed on the body, the leg on the femur (Fig. 4), and with a large knife the soft parts are quickly separated from the posterior structures of the joint. By a little downward traction on the leg combined with the pull of its own weight injury to the vessels is easily avoided. This seems to be much more easily accomplished in this manner than by the operation which attacks the posterior structures of the joint from the anterior aspect. One has at least a better sense of security because one is perfectly sure of the relation of the vessels to the knife.

As soon as the posterior region of the condyles is exposed the femur is sawn through from behind forward and slightly downward at a level sufficient to clear the cartilage behind (Fig. 5.) This saw-cut is carried forward until it reaches the margin of the cartilage on the anterior surface of the femur, and the saw then withdrawn. The direction of this cut should be downward and forward so as to lose as little as possible of the femur and obtain the desired slightly flexed position of the bones subsequently. It is easy to be deceived as to the exact position of the cartilage behind. One's examination should be particularly careful at this stage of the opera-

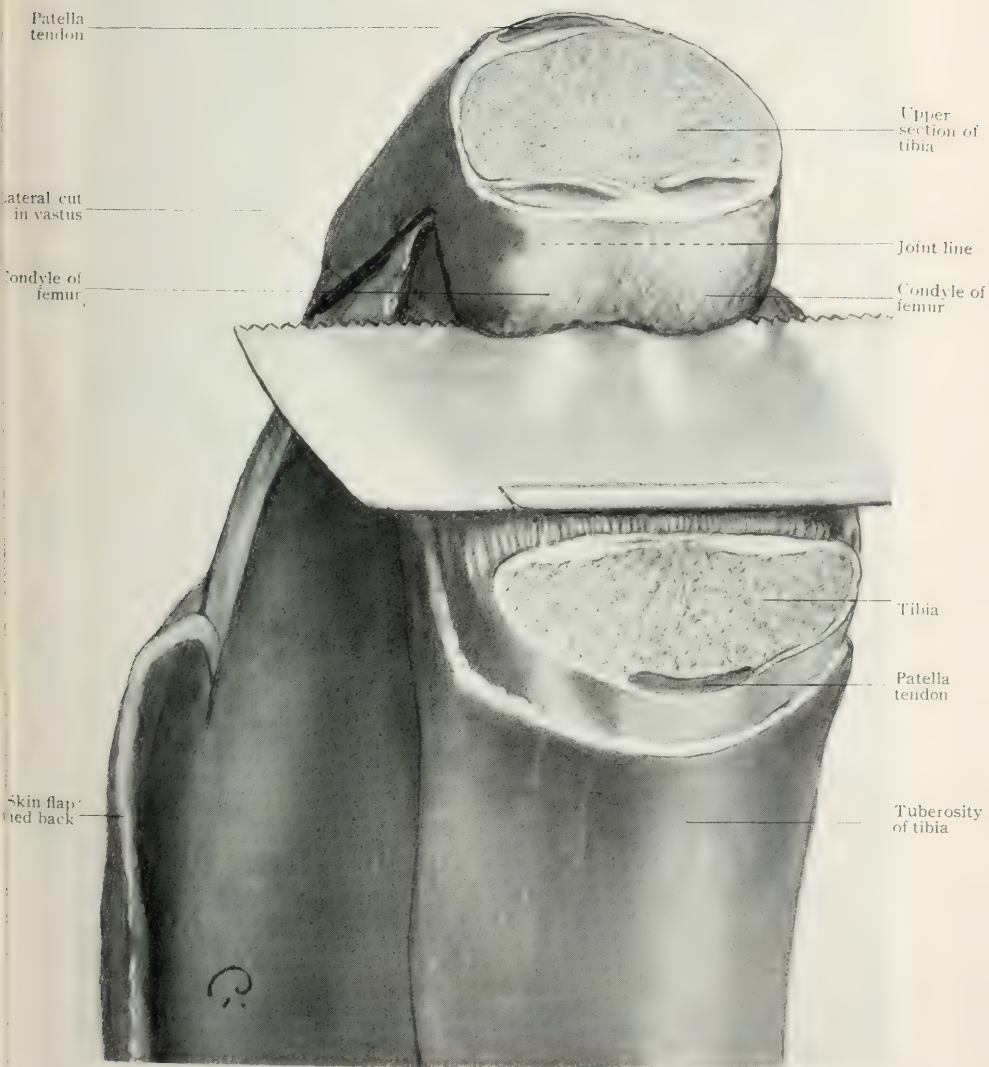


FIG. 5—Leg flexed on thigh—Condyles exposed. Saw in place for section of femur.

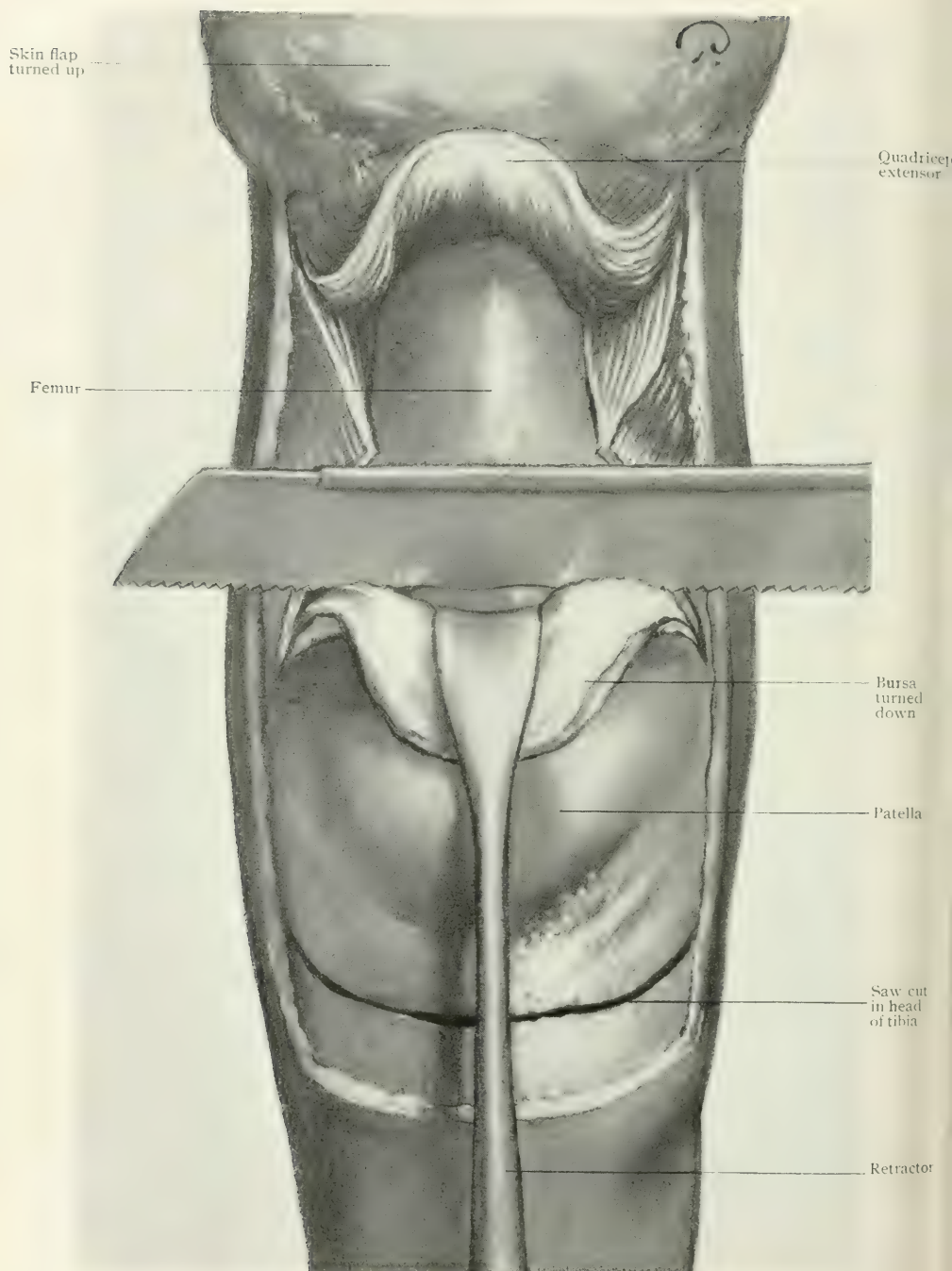


FIG. 6.—Leg horizontal. Bursa pulled down. Saw in place to remove trochlear surface of femur.

Suberural
bursa

Patella

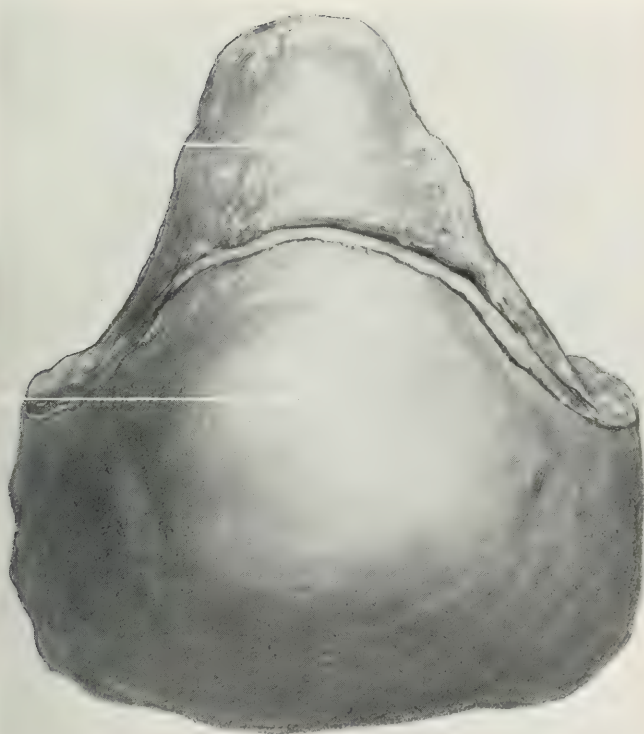


FIG. 7.—Joint removed without opening.

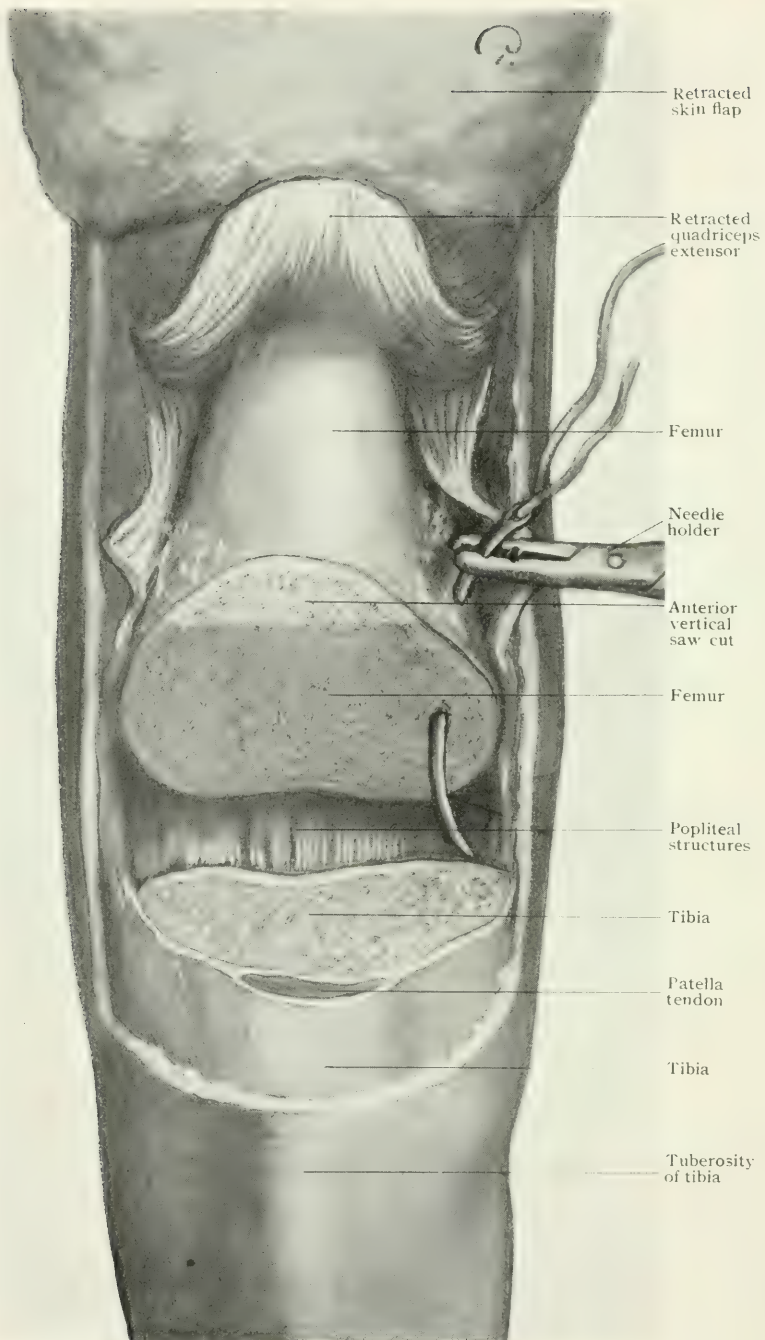


FIG. 8.—Joint removed—Hagedorn needle passed through femur.

tion, otherwise the saw-cut in the femur will be too high up.

After withdrawing the saw from the femur the leg is once more placed in a horizontal position. The saw is introduced behind the subcrural bursa at the upper margin of the articular cartilage on the front of the femur and a cut made which will meet the anterior limit of the horizontal saw-cut made from behind (Fig. 6). This last cut is almost vertical, in the coronal plane, and allows the articular portion of the femur which extends upward in front to be removed with the joint.

This is the last step of the incision proper, for it is now possible to lift out the joint with the patella and subcrural bursa, the articular surfaces of femur and tibia, all complete without having opened the joint (Fig. 7). Up to this point a tourniquet is used, but inasmuch as this part of the operation takes but little time, in fact about ten minutes, and in easy cases six minutes, we do not see the disadvantageous effects of longer use such as would be necessary to obtain complete hæmostasis in an operation which opens the joint transversely or dissects off the structures little by little. On removal of the tourniquet the bleeding points can be quickly clamped and tied, thereby reducing hemorrhage to a minimum.

The subsequent steps of the operation differ in no way from those hitherto customary.

The writer unites the bones with No. 4 chromic catgut, six stitches passed directly through the bone with a large curved Hagedorn needle (Fig. 9). It is usually unnecessary to bore holes. The cortical portion of the lower part of the femur and upper region of the tibia is so thin that it can readily be penetrated by a needle. The needle goes slowly at first and should be held in the holder about one inch from the point so as not to break. (See Fig. 8).

When examination of the cut ends of the bones reveals such an amount of disease left behind as to render curetting inadequate and demand removal of another piece of bone, then we are liable to get into the region where the cortex is so

thick as to make this method of suture impracticable. In such a case we are obliged to resort to a drill.

After the suture of the bone the muscle and skin flaps are turned down and sutured in place. As a rule the amount of retraction in the rectangular skin flap about compensates for the shortening due to resection, so that secondary trimming of the skin is not necessary.

While suturing bone and soft parts and during the time the plaster dressing is being applied the leg should be carefully held in proper position by an assistant.

There are of course extreme cases either with very little tuberculous disease or with very extensive involvement where this operation would not be feasible.

This method of resection has the following advantages:

1. It is quick.
2. There is very little danger of contamination of the wound by tuberculous or other infection from the joint.
3. Hemorrhage can be reduced to a minimum.
4. The operation is thorough, there being but slight chance of leaving diseased tissue behind, thereby diminishing the probability of recurrence.

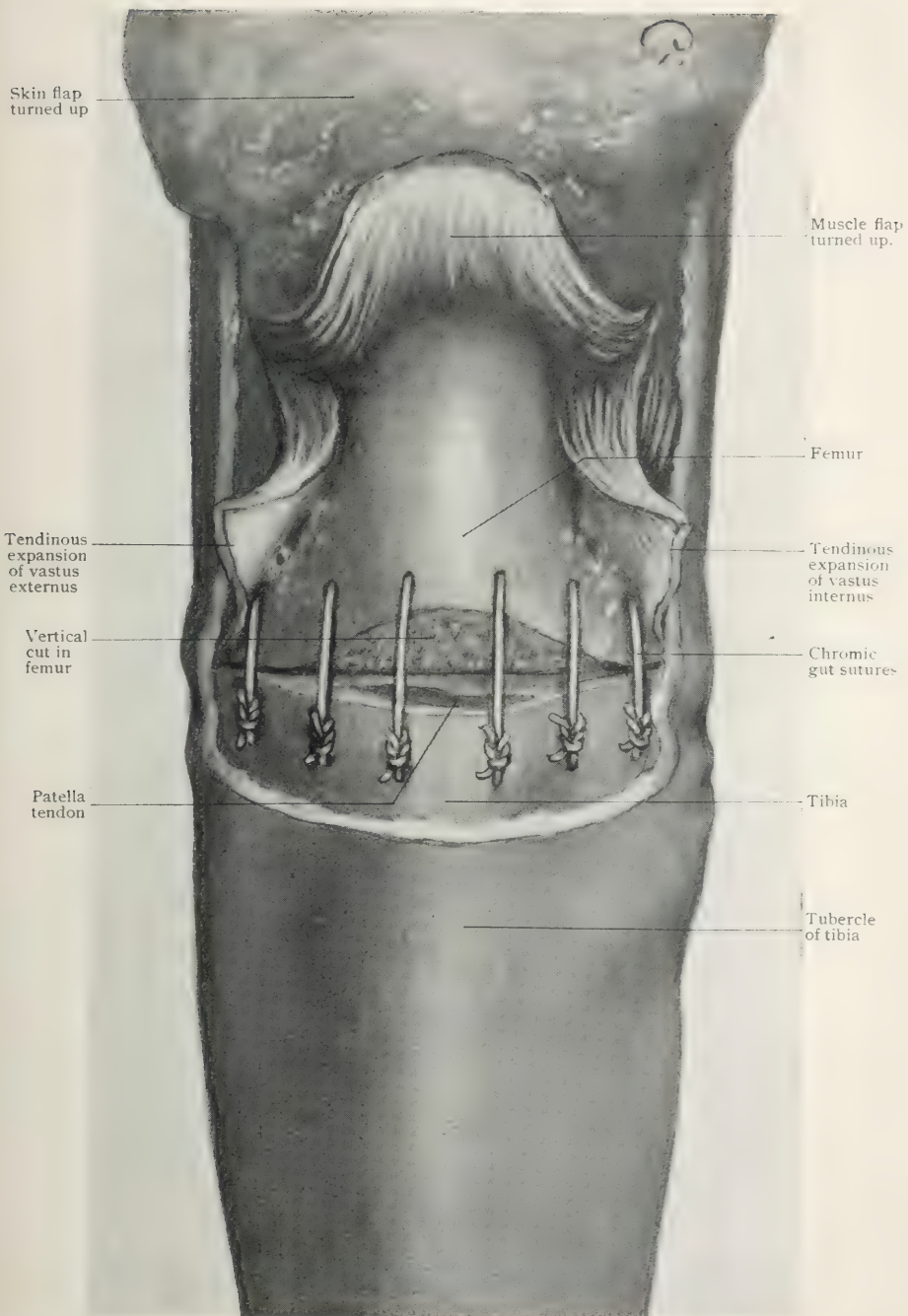


FIG. 9.—Femur and tibia approximated. Sutures in place.

THE EFFECT UPON GLANDULAR TISSUE OF EX- POSURE TO THE X-RAYS.¹

BY WILLIAM J. TAYLOR, M.D.,

OF PHILADELPHIA,

Attending Surgeon to St. Agnes Hospital, and to the Orthopaedic Hospital; Con-
sulting Surgeon to the West Philadelphia Hospital for Women.

THE beneficial effects of the X-rays are so enthusiastically proclaimed by the advocates of its therapeutic use in granular swellings and certain of the new growths, that I think a few of its disadvantages should be spoken of by those who see the after effects and who are forced to operate upon tissues that have been long under its influence. My own personal experience is such as to lead me to advise against the employment of the X-rays wherever there is a probability of the case coming to a formal surgical operation. On account of the alteration in appearance and character of the tissues where its use has been prolonged, operations which would ordinarily be simple and easy dissections become formidable and dangerous, as the tissues are thickened and matted together by fibrous material.

This change in the character, both of the surface skin and underlying tissue, is particularly well marked in cases of enlarged cervical glands,—the so-called tubercular adenitis. Ordinarily operations for this condition are easy to perform, the glands readily peel out by blunt dissection, and the blood-vessels and nerves retain their distinct characteristics, thus being plainly recognized and preserved from injury. The physical characteristics of the tissues of the necks which have been subjected to treatment by the X-rays are, however, markedly changed in appearance; the glands become hardened, and may be shrunk if this method of treatment is employed before they have broken down, and while it is true

¹Read before the Philadelphia Academy of Surgery, December 4, 1905.

that in cases of recent origin many of the swollen glands may entirely disappear, this is not usual. The majority of the glands which the surgeon sees have already broken down and softened in their interior, and the cheesy pus may be simply encapsulated. It is of this variety particularly that I wish to speak.

Most of these cases are of long standing and have been subjected to various plans of treatment by ointment, massage, counter-irritants, etc., before the X-rays are employed. It is only after all the various methods have been tried that the surgeon is requested to operate.

The overlying skin is now found to be thickened, indurated, and much toughened. The glands cannot be peeled out, or pulled away from the blood-vessels and nerves by blunt dissection, but each step must be taken with the greatest deliberation and every particle of tissue that is removed must be separated by cutting with the knife or scissors. The blood-vessels, from the fibrous thickening of their sheath and the surrounding tissues, cannot be easily distinguished; and are only saved from being cut by the utmost vigilance. The dangers, the difficulties, and the time consumed in the operation are thus very materially increased, and my own belief is that the only action of the X-rays in these cases is distinctly harmful.

I have had one case of cystic disease of the left breast in an unmarried woman of 37 where the X-rays were employed, and which subsequently came to operation. The history was that a year before she had discovered a lump in her left breast, but it gave her no discomfort. She consulted a physician, who advised operation, but as her father was very ill and she was nursing him, she refused operative treatment at that time, as she would not leave him. Her family history was bad, as her mother had had cancer of the uterus and her father's illness was supposed to be cancer of the stomach. She elected to try the value of the X-rays and submitted to twenty-eight treatments of ten minutes each. As a result there was an extensive burn of the skin of the

whole breast; the outer layer of the skin peeled off, and this was true also of the areola and nipple. I saw her first when this burn was at its worst. I could feel that the breast was enlarged and that in the gland there was a swelling, which I took to be, and still believe to have been, a cyst. Shortly after this her father died and she then came to me and submitted herself to operation.

The skin over the whole of the breast was very dense and hard and in a condition such as I had never seen before. It was almost impossible to cut through the skin with a very sharp knife without using extreme force. The breast and both pectoral muscles were removed and the axilla cleaned out. At this time I could not distinguish definitely a tumor, but the whole breast was thickened and indurated. The breast, after its removal, was cut open and macroscopically seemed to be simply a mass of fibrous tissue with few of the characteristics of the normal gland. There were one or two small retention cysts. She made an absolutely uneventful recovery, but the wound did not heal quite as rapidly as is usual. The breast was sent to Dr. Longcope, of the Ayer Laboratory, who made this report:

The specimen consists of a breast, pectoral muscle and axillary fat. Section has been made through the breast. It is covered by a piece of skin 1 cm. in diameter. The center appears yellowish and slightly ulcerated. On section the cut surface discloses opaque white breast tissue, which is slightly larger than normal. It is fairly well circumscribed and has a more or less pyramidal form. The margins are well defined, particularly the lower margin, which is separated from the pectoral muscle by a zone of fat about 1 cm. in thickness. The breast tissue is quite firm but flabby. Scattered through it can be seen bits of fat. Here pectoral muscle appears normal. The axillary lymph glands are small, soft and pink in color.

Sections are made from all parts of the breast. They show a coarse net-work of rather dense fibrillated connective tissue enclosing lobules of fat-cells of various sizes. The connective tissue contains extremely few cells. In many sections the acini are lined by two regular rows of cuboidal epithelium which do not differ essentially from the normal, except that many of the

cells contain large fat droplets. Sections through four of the axillary lymph nodes show chronic inflammatory changes. There is some hyperplasia of the lymphadenoid tissue with thickening of the reticulum, especially in the lymph sinuses and proliferation of the reticular cells.

The lymph sinuses are converted into solid cords. The capsule is regular but a little thickened.

Skin.—The epidermis is thickened. At one point there is a small area of ulceration. Here the corium is covered with a thin layer of fibrin. Polymorphonuclear leucocytes and red blood-cells. The corium is greatly thickened and the papillary process atrophied. It consists of rather dense connective tissue infiltrated in circumscribed foci by cells usually of one type. These cells are scattered through the corium, but are most numerous beneath and about the ulcerated surface. They are somewhat smaller, irregular, often have a shriveled appearance and the protoplasm stains intensely blue in hæmotoxylin and eosin stains. The nuclei are very black and piknotic. Sometimes they show a central unstained band which gives the nucleus the appearance of a diplococcus. About the ulcerated area there are also many small round cells, a few polymorphonuclear leucocytes and occasional large multinucleated giant-cells.

Diagnosis.—Chronic mastitis with atrophy of mammary gland. Chronic inflammation of skin with thickening of corium. Chronic inflammation of axillary lymphnodes.

Dr. Longcope states in a letter which accompanies this report that there was no evidence of malignant growth, but, on the contrary, there was marked atrophy of the glandular tissue with extensive fibrous overgrowth in a diffused manner. He considers the thickening of the skin must have been caused by the X-rays, but whether the changes in the breast itself are due to this cause he cannot state positively.

In a very carefully written article by Dr. A. G. Ellis, "The Pathology of the Tissue Changes Induced by the X-Ray" (*American Journal of Medical Sciences*, January, 1903), he quotes Huntington as stating that the X-ray burn consists of an acute, subacute, or chronic necrobiosis. He

quotes Rudis-Jicinsky as saying that, "The irritation of the peripheral extremities of the sensory nerves causes paralysis of the vasomotor and vascular cells affected. Spasmodic contraction of the arterioles and capillaries follows and the proper nutrition of the cells is impaired. With these changes, which are directly depending upon disturbances of the circulation, there are changes in the parenchyma cells of the affected region. The death of tissue follows, being caused by permanent stasis in the blood-vessels. This is carried out by Codman's statement (Ellis) that the reports of microscopic examinations of the excised tissue agree in stating that similar arterial branches are occluded and the appearances are not unlike those of necrosis and inflammation due to other causes.

Scholtz (Ellis) says that the cell elements under the influence of the X-rays undergo a slow degeneration, chiefly in the epithelial cells; that the nucleus as well as the protoplasm of the cell is affected. This article by Dr. Ellis is so exhaustive and carefully prepared that it should be read by all who are interested in this subject.

In the X-rays we have a very powerful therapeutic agent, whose power for good is undoubtedly very great in inoperable malignant disease of a superficial character and as a prevention of the recurrence of malignant disease after radical operation; but I believe that its use should be confined to this class of cases. I do not believe, in view of the extreme difficulties and complications which are produced by its effects, that it should ever be employed upon the tissues before surgical operation is undertaken.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, December 13, 1905.

The President, DR. GEORGE WOOLSEY, in the Chair.

EXCISION OF THE TONGUE FOR EPITHELIOMA.

DR. CLARENCE A. McWILLIAMS presented a woman, 24 years old, who was admitted to the Presbyterian Hospital early in August, 1902, complaining of a painful lump on the side of her tongue, which she had first noticed about three months previously. The pain had gradually increased in severity, and extended down the neck. As chewing solids was very painful, she lived chiefly on fluids, and had lost flesh and strength.

Examination showed a hard, superficial lump, about the size of a silver dime, situated on the left side of the tongue. There was no ulceration. The centre of the mass was slightly depressed, and its edges somewhat elevated, with radiations into the adjacent tissues. It did not extend to the dorsum of the tongue, but impinged slightly on the mucous membrane of the mouth, but not as far over as the attachment of the mucous membrane to the lower jaw. The tongue was freely movable. One gland, the size of a marble, could be felt under the angle of the left jaw.

A section removed from the growth was examined microscopically, and showed flat-celled epithelioma, full of epithelial pearls.

A number of sharp, decayed stumps of teeth opposite the mass on the tongue were removed and on August 20, 1902, the patient was operated on by Dr. McWilliams. An incision was

made from the middle of the jaw downward to a point just below the cornu of the hyoid bone, and thence up to the angle of the jaw. This flap was dissected up, exposing the enlarged sub-maxillary gland, which extended down to the cornu. The external jugular was ligated and divided, and all enlarged glands in the submaxillary triangle were removed. The lingual artery was ligated, together with its vein. The patient's head was then turned strongly to the right, the right side of the tongue transfixed by a silk thread, and drawn fully out. An incision was made on the dorsum of the tongue, widely encircling the epitheliomatous mass, and extending deep into the muscles of the tongue and over to the attachment of the mucous membrane to the jaw. The knife, passed from below, then divided the attachment of the mucous membrane from the jaw, and the entire mass was removed, together with the enlarged submaxillary and sublingual glands, in one piece. The hemorrhage from the tongue was controlled by means of two clamps. Three gauze drains were introduced from below. The raw edges of the tongue were brought together with catgut, excepting for a distance of about one inch posteriorly. The wound below was closed as far as possible with interrupted silk sutures. An inch and a quarter of the anterior lateral portion of the tongue was removed.

The patient made a satisfactory recovery and as a prophylactic measure submitted to X-ray treatments to the neck for about a year afterwards. Temporary paralysis of the left lower face followed the operation. This has almost but not entirely disappeared. Over three years have now elapsed without sign of a recurrence. The patient's speech is perfect. She has since married, and borne one child.

DR. L. W. HOTCHKISS reported three cases of cancer of the anterior portion of the tongue upon which he had operated during the past two years. In one the patient was now in his second year and showed no signs of a recurrence. In the second, a recurrence had taken place about eighteen months after the operation in the tip of the portion that was left. The third case was that of an old woman with a small epithelioma of the tip of the tongue, in which a wedge-shaped section was removed. In all of the cases, the operation was done through the mouth.

RESULT OF RESECTION OF ELBOW AND HIP AFTER TEN YEARS.

DR. MCWILLIAMS presented a patient who was admitted to the Presbyterian Hospital in January, 1896. He was 13 years of age. Eight months prior to the time of admission he fell, injuring his right hip, which became swollen. For the past five months he had been confined to bed, and two months prior to his admission the right elbow had become involved with the formation of a sinus. Sinuses had also formed over the left hip. The lungs were healthy.

On January 31, 1896, Dr. Charles K. Briddon resected the elbow, sawing through the ulna just below the coronoid process, and through the neck of the radius at a corresponding point. The humerus was removed nearly to the epiphysis. The arm was put in full extension for two weeks; then in mid-flexion.

Three weeks after the first operation, Dr. Briddon resected the necrosed head of the femur at its junction with the neck, and thoroughly curetted all the sinuses. Buck's extension was then applied to the leg.

The patient improved rapidly, and left the hospital on June 15, 1896. The affected leg was two inches shorter than its fellow, but the motion was good. The function of the right elbow was excellent, with good rotation and flexion to the extent of a right angle.

At the present time flexion and extension of the elbow are perfect, but there is some lateral mobility, which does not impair the usefulness of the arm, which can be used perfectly for all ordinary purposes. His favorite amusement is throwing a baseball. An X-ray photograph shows a posterior displacement of the radius and ulna on the humerus. He is able to walk without the aid of a cane, although there is a shortening of the limb of about two inches. The X-ray photograph shows a displacement of the neck of the femur above the acetabulum.

PARTIAL GASTRECTOMY FOR CARCINOMA.

DR. LUCIUS W. HOTCHKISS presented a young man of 23, who was admitted to The Hood Wright Hospital on October 9, 1905, with typical symptoms of carcinoma of stomach, of three months' duration.

Examination showed a fairly well developed, but thin and anæmic man. A tumor, about the size of a large hen's egg, was felt in the epigastric region. It was freely movable, and could be pushed from side to side and up under the ribs. It was hard and nodular, and moved slightly with respiration. It was slightly tender to pressure. On admission, the patient's temperature was 100; pulse, 72; respiration, 20.

Operation, October 20, 1905. Through a median laparotomy wound the abdomen was opened, and a movable mass was found invading the posterior wall and pyloric end of the stomach. There were some enlarged glands in the greater and lesser omentum, and one point of adhesion between the omentum and stomach. There were no adhesions posteriorly. The lesser omentum was ligated and divided close to the liver. The greater omentum was then ligated as high up as the Hartmann-Miculicz line, and the stomach clamped off in such a manner as to include the whole of the lesser and a considerable portion of the greater curvature. The stomach was then divided between the clamps, and the diseased portion, including the pylorus, about one-third of the stomach walls and about an inch and a half of the first portion of the duodenum were removed. The cut ends of the stomach and duodenum were inverted by suture in the usual manner, and an anterior gastroenterostomy was made by suture between the lower part of the anterior wall of the remaining section of the stomach and the jejunum.

After the operation, the patient was nourished entirely by enemata for three days, and then, as there was no vomiting after the second day, small sips of water, hot clam-broth and peptonized milk were allowed at frequent intervals. On the ninth day the nutrient enemata were discontinued, and soft-boiled eggs were added to the dietary, and, a few days later, chopped meat, bread and soft diet. Barring partial failure of the external wound to unite, probably on account of the patient's anæmic condition, the convalescence was afebrile and without any drawbacks, and he was discharged from the hospital on November 21, 1905. At that time he was able to eat ordinary food and to digest it well.

Examination of the specimen removed showed a large growth projecting from the mucous membrane of the stomach,

involving the anterior and posterior walls and both curvatures of the stomach, and beginning to obstruct the pylorus. In its gross appearance it resembled a cauliflower-like growth projecting into the cavity of the stomach from its posterior wall, and infiltrating the gastric wall far beyond the limits of the projecting mass itself, which measured, roughly $3\frac{1}{4} \times 4 \times 4\frac{1}{8}$ inches. The pathologist reported the growth to be a carcinoma.

The patient had gained about fifteen pounds since he left the hospital, and his general health was much improved.

ACUTE TETANUS TREATED BY INTRASPINAL INJECTIONS OF MAGNESIUM SULPHATE.

DR. JOSEPH A. BLAKE presented a boy fifteen years of age, who was admitted to the Roosevelt Hospital on November 3, 1905, with the following history: Nine days before admission he had crushed off the ends of the first three fingers of the left hand. Two days before admission he commenced to have stiffness of the jaw and neck, and could not fully open his mouth. He also complained of pain in the back of the neck. The initial symptoms consequently developed seven days after the injury.

On the day of admission, the jaws could be separated for three-quarters of an inch; the sterno-mastoids were prominent and in spasms, flexion and extension of the neck were not painful; lateral motion was painful and limited. The following day there was little increase in the symptoms. That morning, Dr. Walton Martin, under nitrous-oxide-ether anæsthesia, dressed the fingers by curetting them, cutting off necrotic fragments of tissue and swabbing them with tincture of iodine. At the same time he injected into the spinal cord (introducing the needle between the fourth and fifth cervical vertebræ) forty cubic centimeters of antitoxin, and an additional twenty cubic centimeters into the median cephalic vein. That night the temperature rose to 102° ; there was increased stiffness of the neck and jaw, and commencing spasms of the vertebral muscles. The day following the operation and injection the rigidity had increased, there were commencing spasms of the muscles of the lower extremities, and opisthotonus. That afternoon thirty-five cubic centimeters of antitoxin were injected into the spinal canal

by lumbar puncture. The same night the patient's temperature reached 104.4° . On the second day following the first injection there was marked opisthotonus, but the contraction of the masseters had not increased. The temperature during this day was high, between 103° and 104° ; the pulse between 104 and 112, and the patient was evidently feeling the strain of the almost constant convulsions and severe pain. In twenty-four hours, 24 minims of Magendie's Solution had been required. His condition being very grave, it was decided to try the effects of the intraspinal injection of magnesium sulphate in controlling the convulsions; accordingly four and one-half cubic centimeters of a solution of magnesium sulphate, 25 parts in 100 parts of water, were injected by lumbar puncture, this being approximately the amount recommended by Dr. S. J. Meltzer for the production of anæsthesia.

Two and three-quarter hours after the injection the patient was stuporous, the spasm of the neck was lessened, the opisthotonus was gone, there was no effect from irritation of the trunk or extremities, but pricking of the face produced response. Six hours after the injection the mouth could be opened wide; the stiffness of the neck and back had disappeared; sensation was present in the face, trunk and legs; the arms and legs could be moved slightly; there was no pain, and the temperature had fallen to 102.6° ; the pulse to 104; the respirations were 14. The patient seemed drowsy, but took nourishment well. Nine hours after the injection, the temperature rose to 104° , but responded to an alcohol sponge, and fell during the next twenty-four hours to 101° .

During this time the convulsions were in abeyance; the jaw was relaxed, but at the end of the day following the day of the injection, there was increasing pain and stiffness of the neck and back muscles, and at 9 P.M. on November 7, thirty-three hours after the first injection, opisthotonus had returned. The same amount of magnesium sulphate was again injected into the spine, and was followed by the same improvement as was noticed after the first injection although it was followed by a rise in temperature to 103.4° .

The injection did not have to be repeated until November 9, at 10.30 A.M., an interval of thirty-seven and one-half hours

having elapsed. The opisthotonus and pain had then returned. At this injection, by advice of Dr. Meltzer, eight cubic centimeters of a 12.5% solution were used. The same good effects were noticed after this injection, excepting that the relief did not seem quite so marked as after the injection of the stronger solution. On November 10, twenty-nine hours afterward, the pain and opisthotonus having returned, a fourth injection was given; eight cubic centimeters of the 12.5% solution being used, the same as in the third injection. This was followed by a similar relief of the symptoms, and although there was a return of the stiffness of the neck and back muscles, and some pain, he was kept comfortable with morphine and chloral. His temperature reached normal on the thirteenth day of his disease, the seventh after the first injection of magnesium sulphate. On the sixteenth day of the disease, the convulsions, which during the preceding days had resembled those of a case of chronic tetanus, became much more pronounced and violent, and a fifth injection of eight cubic centimeters of the 12.5% solution was given. The relief after this injection persisted, and he gradually improved and was practically well by December 1. During his illness, the wound was dressed daily with weak iodine water.

Dr. Blake said that the following conclusions might be derived from this case: That repeated intraspinal injections of magnesium sulphate may be safely given; that they have a marked effect in restraining the convulsions and relieving pain, probably by inhibition of both afferent and efferent impulses; that the restraint of the convulsions diminishes metabolism and heat production; that, probably, the spasm of the muscles of mastication is diminished, although that was not proven by this case, since the jaw was not closed at any time; that in this case the period of control of the convulsions was about thirty-six hours (twenty-nine to thirty-seven and one-half) but that this period, judging from the effects of magnesium sulphate in other cases, will probably differ in different individuals.

Of course, there was nothing specific in the action of magnesium sulphate in tetanus. Its exhibition was symptomatic. If its effects would prove as beneficial in other cases as they had in this, it would at least be of great value in controlling the convulsions and preventing exhaustion. It is difficult to say how

much benefit had been derived in this case from the injections of the antitoxin.

DR. ROBERT H. M. DAWBARN mentioned a case of acute tetanus treated by him at the City Hospital by means of intraspinal injections of the Board of Health antitetanic serum in large doses. This case ended fatally, and shortly afterwards, the speaker said, he met Dr. Richard Kalish, President of the Hospital Board of Physicians, who stated that many years ago, while serving as an interne at Bellevue Hospital, eight cases of lockjaw came under his care. The first five of these cases were treated in the usual way, with bromides and chloral in large amounts, and all ended fatally. The three remaining cases, which were equally severe, were given very large hypodermic injections of the fluid extract of *physostigma venenosum*, and all three recovered.

Dr. Dawbarn added that it seemed to him a better plan, if we wished to test this claim, to inject an alkaloidal salt of physostigmine (*eserine*), say the salicylate, which is officinal, instead of using the fluid extract of the crude drug; for in this way we avoid introducing calabarine too—which is the spinal-excitant principle, resembling strychnine in effect, less in amount than physostigmine, in the drug, but always present.

Dr. Dawbarn said the objection that might be raised to the use of chloral in tetanus on the ground that it weakened the heart action did not apply to physostigmine. Those two remedies should not be classed together. The latter drug possessed the peculiar quality of increasing the force of the heart's action, and at the same time diminishing its frequency, even though all the nerves of the heart be cut (quoting H. C. Wood's "*Materia Medica*"). The only reason that with its desirable properties physostigmine is not used as a heart tonic is its motor depressant action upon the spinal cord, which is the cause of its employment by Dr. Kalish in the cases quoted. Dr. Dawbarn added that Dr. Kalish agreed that he should as a duty have reported these instances without delay; and had authorized the speaker to do so now.

DR. ALEXANDER B. JOHNSON said that a few days ago he saw a case of acute tetanus in which the intra-spinal injections of magnesium sulphate were of no avail.

DR. SAMUEL J. MELTZER said the case reported by Dr. Blake furnished corroborative evidence of a number of facts. One was, that repeated intraspinal injections of magnesium sulphate had produced no injurious after-effects; another was that the injection of the salt was immediately followed by a relaxation of the tonic and clonic contractions of the muscles, and furthermore, that the opisthotonus and trismus and contraction of the facial muscles were at once relieved. This showed that the effects of the drug extended as high up as the origin of the cerebral and cervical nerves. These same results of the intraspinal injections of magnesium sulphate he had observed in a more extensive and reliable way in animals, especially in monkeys. Repeated experiments in monkeys had shown that the most severe forms of opisthotonus and trismus could be relieved in a very short time. The effects of the drug were first observed in the lower extremities, and then spread over the entire body.

RECURRENT VOLVULUS OF THE SIGMOID FLEXURE.

DR. JOSEPH A. BLAKE presented a man, 63 years old, who was admitted to the Roosevelt Hospital, the first time, on December 31, 1902, with a history of chronic constipation of an extreme type for the previous five years, and complete obstruction, with fecal vomiting, of five days' duration. Operation revealed a volvulus of 360° , of the sigmoid flexure. The loop was enormously distended, but not gangrenous, and on lifting it from the abdomen, it had to be incised to prevent its bursting. After it had been emptied, it was sutured to the abdominal wall through a second intermuscular incision in the left iliac region. Immediate convalescence was uneventful, but he returned to the hospital seven weeks later with an abscess in the lateral wound where the gut had been sutured. This was evacuated, and a few days later he developed all the symptoms of acute intestinal obstruction. A diagnosis of obstruction at the point of suture of the gut to the abdominal wall was made, and the gut was opened at this point through the incision made for evacuation of the abscess. This gave him immediate relief, and in a few days, normal evacuations, per anum, were reëstablished, and the colostomy wound closed of itself.

The patient was next seen a year later, when he returned to the hospital on January 13, 1904, with another attack of volvulus. Median cœliotomy was again performed, and a condition exactly like that present at the first operation was found. There was absolutely no sign of adhesion of the sigmoid to the abdominal wall, to which it had been sutured at the first operation, and no evidence of the colostomy. The gut wall, however, was markedly thickened, and showed numerous striæ of adventitious connective tissue. The loop, which was much distended, was untwisted and emptied through a rectal tube introduced per anum. He left the hospital in good health a month later.

On November 14 last he again returned to the hospital with the same symptoms of obstruction, this time of three days' duration. His condition was good, although the vomitus had been feculent for twenty-four hours. Immediate cœliotomy was performed, the incision being made just to the left of the old median scar. The incision was carried very carefully down through the old scar tissue for fear of injuring adherent intestine, but with all this precaution, a loop of the ileum which had become imbedded in the scar was incised. Attention was first attracted to it by its persistent bleeding. It now became necessary to separate the gut in order to repair it, which proved to be an almost hopeless task, inasmuch as a large area of adhesive peritonitis had formed, gluing loops of small intestine together and to the abdominal wall in an almost inextricable mass. It required an hour of careful and patient dissection to separate these, and by this time the wounded loop was so injured as to demand a resection of about six inches. This was done, and an end-to-end suture made.

The volvulus of the sigmoid flexure was then uncovered, and found to be twisted through two complete turns, the loop having insinuated itself through an opening between the adherent coils of small intestine. It was reduced, and the distended loop emptied with a rectal tube per anum as in the previous operation. The gut showed still more thickening, and its mesentery was dense, and much narrowed.

The patient's recovery was uninterrupted, save for a stitch abscess. The only permanent cure for this case would be excision of the entire sigmoid flexure. One would hesitate to do

this during an attack, and the age of the patient would hardly warrant it as an interval procedure. Moynihan excised the sigmoid flexure in a case of volvulus that had recurred a second time.

This patient has had three attacks of volvulus, and one attack of ileus, due probably to a kink from a misdirected attempt to anchor the loop.

TYPHOID PERFORATION OF THE ILEUM.

DR. WOOLSEY reported the history of a boy of 17, who was admitted to the medical division of the Presbyterian Hospital on May 29, 1905, with typhoid fever. He ran an irregular temperature for eight days; then it fell to normal and remained so for nineteen days. The Widal test at that time was negative. On the thirty-first day after his admission to the hospital there was apparently a relapse of his typhoid fever, with a temperature as high as 104, and new rose spots. The Widal reaction was still negative. The leucocytosis was 6,500.

On the thirty-fourth day of his relapse (June 28), the temperature was irregular, with a downward trend. On that day the patient first complained of pain in the right lower quadrant of the abdomen, radiating into the scrotum and penis. There was marked tenderness on both sides, especially below the umbilicus. The recti were markedly rigid. Liver dulness was normal. Five hours later the temperature had risen from 101 to 105, with a pulse of 118; respirations, 28. The leucocyte count was 7,700. There was no vomiting. Abdominal respiration was restricted, and absent in the lower half. The abdomen was universally tender, and there was rigidity below the umbilicus. There was slightly shifting dulness in the flanks; no fluid wave.

Six hours after the first symptoms of perforation, an incision was made through the right rectus. The peritoneal cavity contained a considerable amount of free greenish fluid, of foul odor, but no gas. A perforation of the gut, about one-quarter of an inch in diameter, was discovered about fifteen inches from the ileocaecal valve. A purse-string suture was applied, but on drawing it tight it cut through, and was thereupon replaced by two rows of silk Lembert sutures. The peritoneal cavity was

then irrigated with saline solution, and a large, rubber drainage-tube with gauze core was inserted into the pelvis.

The patient made a good recovery from the operation, and his temperature had dropped to 99 the next morning. It remained low until the fifth day, when it rose to 103. From that point it gradually fell, and never went above 102. The drainage-tube was removed on the third day, and the sutures three days later.

Subsequently, the edges of the wound separated, and were brought together by strapping.

A curious feature in connection with the case was that the temperature of the relapse persisted for 60 days, but during its course declined as if at the close of the relapse and then rose suddenly and continued higher, indicating, apparently, a double relapse. After recovering from his second relapse, the temperature remained normal for nine days, then again became elevated, accompanied by new rose spots, a palpable spleen, etc. It finally dropped to normal on the one hundred and seventh day of the disease, and remained so, and the patient left the hospital, cured, on the one hundred and forty-sixth day.

Dr. Woolsey said that this was the third case of typhoid perforation that he had operated on last summer, and it was the only one that had recovered. In one of the fatal cases the perforation was in the ileum, and the operation was done too late. In the other case, there were no perforations in the ileum but two perforations of the sigmoid flexure. A large area of the sigmoid was in a semi-necrotic condition.

METALLIC FOREIGN BODIES IN A BRONCHUS.

DR. GEORGE R. FOWLER read a paper with the above title.

DR. B. FARQUHAR CURTIS had recently operated upon a boy, ten years old, who inhaled the metal cap of a pencil, which was located in the left bronchus. The symptoms were almost the exact counterpart of those in one of the cases recounted by Dr. Fowler. The obstruction produced complete loss of respiration on the affected side, excepting in the upper lobe. There was a slight cough, and the patient's temperature gradually rose to 101. A low tracheotomy was performed, a curved uterine forceps was introduced through the wound, and the foreign body was

easily found and removed. The boy made an uneventful recovery, in spite of the fact that the withdrawal of the pencil cap was followed by several drams of pure pus.

Dr. Curtis was inclined to believe that an ineffectual search for a foreign body through the tracheotomy wound should not be persisted in for longer than half an hour. If, at the end of that time, the patient's condition warranted it, he should be immediately turned over and the chest opened from the back. Some years ago he had published (*ANNALS OF SURGERY*, 1898,) the case of a boy who had inspired a dried berry with a pin thrust through it. The X-rays failed to throw any light upon the position of the foreign body, but the physical signs showed that it was in the right bronchus. It was located through a deep tracheotomy wound, and efforts were made to grasp it, but these proved unsuccessful, and were abandoned after three-quarters of an hour. At this time, three days after the accident, symptoms of pneumonia were already present. The following day the chest was opened from the back, but owing to the lack of proper instruments to retract the lung, the foreign body could not be reached. After waiting another twenty-four hours to allow pleural adhesions to form, the bronchus was reached and opened but the foreign body could not be extracted owing to its softened state. The patient died two days later of pneumonia.

His experience with this case had convinced him on two points: First, That attempts to remove a foreign body in the bronchus through a tracheotomy wound should not be too prolonged; and, second, one should not wait until the next day to open the chest from behind, but should proceed immediately with that operation.

Dr. McWILLIAMS reported a case recently seen by him at the Presbyterian Hospital, in which the value of the bronchoscope was well illustrated. The patient was a child of five years that two days prior to its admission to the hospital had inspired a bean. An examination of the chest revealed dulness and diminished breathing on the right side, with many râles. The X-ray showed nothing. The following day the physical signs indicated a general bronchitis, with an increased area of dulness and a loss of breathing sounds. The case was regarded as one of foreign

body in the bronchus. Dr. Emil Mayer saw the patient and introduced his bronchoscope through a low tracheotomy wound, and readily located the bean at the bifurcation of the right bronchus. Then, with another instrument, he grasped the bean, but it was so brittle that it broke, and had to be removed piecemeal. The child died on the following day of pneumonia. The speaker called attention to the fact that it required considerable dexterity to use the bronchoscope, although no more skill is necessary than in the use of the cystoscope or endoscope. The bronchoscope promises to solve all the difficulties attendant upon the extraction of foreign bodies of all kinds from the bronchi.

DR. OTTO G. T. KILIANI mentioned a case that he had reported at a meeting of the Society about a year ago. The patient, a boy, was holding a silver horse-shoe pin between his teeth. His room-mate, in order to get possession of it, grasped the boy's nose, and the pin was suddenly inspired into his larynx. The boy at once came to New York, and a tracheotomy was done, and the pin was coughed up through the wound. It had given rise to no symptoms, and had been located in the left bronchus. The patient made a rapid recovery. In another case that he saw, the foreign body was a military uniform button, which was removed from the left bronchus through a tracheotomy wound by means of a forceps.

In both of these cases, Dr. Kiliani said the bronchoscope was tried, but it was exceedingly difficult to do anything with it. Its use required a good deal of practice.

DR. CHARLES H. PECK mentioned a case of a pin in the left bronchus which was operated on by Dr. Robert F. Weir. The patient was a child, two years old. The pin, which was located with the X-rays, had a spherical, gold-plated head, which rested on the secondary bifurcation of the left bronchus. A low tracheotomy was done, and the pin was removed after one or two trials with a slender pair of forceps.

DR. GEORGE D. STEWART said his assistant had made some experiments by introducing shot into the trachea and subsequently locating them with the X-ray, and he had found that the right bronchus, instead of being more horizontal than the left, was more vertical which furnished another reason why foreign bodies more frequently found their way into the right tube.

He reported a case that came under his observation, in which a lima bean had been inspired and had lodged in the right bronchus. A low tracheotomy was done, and an attempt made to grasp the bean, but the instrument used was so large that the patient ceased to breathe. A flexible rubber catheter was introduced, passing the bean and entering the left bronchus. During further manipulation oxygen was administered. A smaller forceps was introduced beside the catheter and the bean was extracted. The patient recovered.

Another case was that of a small boy, who, while sucking some candy that contained a whole almond, had a violent paroxysm of coughing, and the candy suddenly disappeared. The family physician was sent for, who thought the candy had been expelled. The paroxysms of coughing, however, persisted for several days, and the boy was then brought to the hospital. One of the physicians connected with the hospital examined the chest and found evidences of bronchitis, but believed there was no obstruction of the bronchus. To Dr. Stewart it appeared, however, that there was lessening of the volume of air inspired into the right lung particularly over its upper lobe. The X-ray showed nothing. An examination of the chest was apparently negative. As the boy's temperature was gradually going up, a low tracheotomy was done, and an almond, an inch and a quarter long, was removed from the right bronchus. Its larger end pointed downward, while its smaller end protruded into the trachea. Some pus followed the extraction of the nut, and the boy eventually made a good recovery.

DR. FOWLER, in closing, said that thus far he had never had a case in which he considered posterior thoracoplasty justifiable, and in the light of the experience of others he was inclined to regard posterior thoracoplasty as the most difficult and probably the most impracticable operation in surgery. In desperate cases it might be justifiable, but it should not be offered with much hope of success.

The bronchoscope introduced by Kiliani some years ago, was simply a urethroscope on a little larger scale. The foreign body could not be extracted with the bronchoscope; it would simply help in guiding the forceps, and large foreign bodies would not pass through the lumen of the instrument. Further-

more, as had already been pointed out, it was exceedingly difficult to manipulate it without much practice.

A LEAD PENCIL REMOVED FROM THE CÆCUM.

DR. GEORGE D. STEWART showed this specimen. The patient from whom it had been removed was a longshoreman, 31 years old, who came to St. Vincent's Hospital with the history that for the past two years he had had repeated attacks of pain in the right iliac region, with occasional vomiting. These attacks lasted for two or three days; sometimes a week, and compelled him to give up his work.

Examination of the abdomen revealed a small, rather hard and sensitive tumor in the right iliac region directly under McBurney's point. The case was regarded as one of appendicitis, and when the abdomen was opened, four days ago an inflammatory mass was found with dense adhesions to the anterior abdominal wall. Upon inserting the finger, Dr. Stewart felt what he supposed was a hard concretion in the appendix. It continued upward, however, and was finally lost behind the liver. He then concluded that he had to deal with a foreign body. This body he succeeded in getting down into the lumen of the appendix, and upon cutting off that organ, he was able to grasp and remove the foreign body, which proved to be an ordinary lead-pencil, a little over seven and a-half inches long. The blunt end of the pencil had been directed downward; the point upward behind the liver; and it had apparently occupied the entire length of the cæcum and ascending colon.

Upon questioning the man after the operation, he first asserted that he had swallowed the pencil twelve years ago, but as this was not credited on account of the anatomical difficulties a foreign body of this length would have to overcome before reaching the cæcum, he finally admitted that two years ago, while suffering from constipation, he had inserted the pencil into the rectum and it had slipped from his fingers and out of his reach. He then went to a hospital, where he was examined under ether, but no trace of the pencil was discovered. An attempt was also made to locate the foreign body by means of the X-rays, but failed.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, December 4, 1905.

The President, HENRY R. WHARTON, M.D., in the Chair.

THE OPERATIVE RESULTS IN AN OLD FRACTURE OF THE PATELLA.

DR. EDWARD MARTIN presented a man who in May, 1905, had by a direct fall upon the patella fractured that bone, the fracture probably being comminuted. Two months later he came to the hospital with his knee-joint absolutely stiff and very painful, the patella being firmly fixed by adhesion to the anterior surface of the lower articulating end of the femur, and also to the skin. Operation was performed in the usual way by turning a broad flap from above downward. The upper fragment was firmly adherent to the femur by tissue that was almost bony in character. After the removal of several small splinters, the bone and capsule were sutured in the ordinary manner, the patella with silver wire passed through drill-holes. The patient did well and at the end of three weeks went home with a freely movable patella and a painless smooth flexion of 45° . A few weeks ago he returned because motion in the knee was not sufficient to allow him to go upstairs readily or to stoop, positions required in his work. Examination showed that the joint appeared to lock and on forced flexion pain was felt on the outer side of the articulation. The patella was firmly united by bony union. Reopening the joint was considered, but under moderate anæsthesia flexion was carried to beyond a right angle. Two days later the joint was again bent,

under ether, and the patella refractured. Dr. Martin now intends to allow the man to go home with a slight separation of the fragments (maximum in flexion $\frac{1}{4}$ in.) as this may give him a more useful knee; he has been allowed to walk about since the fracture. The case illustrates that it is not necessary to transplant a soft flap between a patella which has grown to the femur and the surface of the latter bone after loosening their adhesion as the same result can be secured by passive movement of the bone. It also suggests that some of the good results reported from the use of such flaps may have been due to passive motion after operation. He also believed that a longer period of delay after operation before forcibly breaking up adhesions would have been desirable.

EXTENSIVE ANGIOMA OF THE FACE.

DR. MARTIN presented a boy of 12, who had been under treatment for eleven months. The angioma, which was noticed the second day after birth, involves the entire upper lip and extends well toward the left eye. It is adherent to the skin, the vessels of which are also affected, and extends into the mouth as far as the soft palate. Plastic operation seems out of the question, as any radical surgical proceeding could not help leaving an enormous scar and excessive disfigurement. Galvanopuncture was employed every second or third day for several weeks, the needle being inserted about the periphery of the mass but from this no distinct benefit was derived. The injection of absolute alcohol, 20 minims once a week, was then begun and has been carried out for some months. This procedure is followed by inflammation and contracture and is undoubtedly causing improvement. Dr. Martin is now contemplating the use of subcutaneous ligature or of causing a greater degree of inflammation by inserting sterilized catgut. The latter may be accomplished by passing a large hollow needle through the plexus of veins, having a piece of catgut through the lumen of the needle; withdrawing the needle, leaving the catgut in its place, and cutting both ends of the gut close to the skin. This should encourage the formation and subsequent organization of an extensive exudate.

DR. JOHN B. ROBERTS mentioned a case of angioma of the lip, in a child of three, recently under the care of Dr. J. P. Hutch-

inson at the Methodist Hospital. A good deal was gained in that case by subcutaneous ligature; and now Dr. Roberts is injecting with success boiling water after the manner of Wyeth. A year ago he operated on an infant with a large angioma of the brow which had been subjected to almost all the disfiguring operations resorted to in these cases, without permanent benefit. It was cured by the use of Wyeth's method. There seemed to be but little irritation caused by the injection, though five or six punctures were made at each sitting. The method is a very valuable one.

DR. RICHARD H. HARTE spoke of a case which some years ago was under the care of Dr. Hodge in the Presbyterian Hospital. It was similar to the case shown by Dr. Martin, except the growth did not extend so far toward the nares. Dr. Hodge succeeded in applying a ligature and this was followed by satisfactory results. Regarding the Wyeth method of using hot water, Dr. Harte had one case of angioma involving the hand and forearm in which he employed the injections extensively. His experience is that a great deal of care and caution must be exercised in its use. In many cases if water be used indiscriminately, disastrous results will follow. In angiomas injection does cause an inflammatory thickening and the mass shrivels and disappears. Dr. Harte finds that a great deal of reaction follows the injections; at one time he was quite alarmed by the after symptoms in his case.

URINARY INFILTRATION; ACUTE SEPSIS; RECOVERY AFTER PERINEAL SECTION.

DR. DE FOREST WILLARD reported the history of a mulatto, 24 years of age, who was admitted to the Presbyterian Hospital December 1, 1905, with a temperature of 104.2. He gave a history of gonorrhea six years previously with intervals of urethral discharge since that time. He had had no previous retention of urine, no ardor urinæ, except occasionally when the stream would be interfered with. An advertising doctor whom he visited in New York (according to his account) divided his meatus and apparently did an internal urethrotomy with an intensely infected instrument. He returned to Philadelphia the same even-

ing and drove about the city as coachman the following day, bleeding somewhat from the urethra. In the evening he had a considerable hemorrhage. On admission he was bleeding slowly from the urethra and the following day there was so much oozing that no instrument was passed. His perineum was bulging but was not hard, but was moderately tender. The following night he had two chills, after which his temperature rose to 108.4; pulse 176. The temperature was taken by the mouth by a careful nurse, and was verified a half hour later by the head nurse, when it was still 107.8; leucocytes 17,000 to 24,000; urine, blood tinged; bowels moved involuntarily in bed. Abundant staphylococci only in blood.

Dr. Hodge then made a median perineal section. An English catheter was inserted into the bladder and on a grooved director the urethra was split back to the prostate only. The catheter was left in the bladder and connected by a tube to a urinal. The hemorrhage was considerable but was controlled by packing. No pus was found, but the oozing of the septic products and toxins was free and the effect upon the temperature and pulse was speedily evident and improvement was rapid. He was discharged from the hospital in twenty days with an opening still in the perineum. Steel sounds to be passed at regular intervals to insure the formation of the proper sized urethra.

A peculiar part of the history is the insistence by the patient that the operation from which he so narrowly escaped death was performed, not for stricture, but for the cure of seminal emissions.

The reporter said that he had never before, save in sun-stroke, had a recovery when the temperature reached 108.4.

DR. WILLIAM J. TAYLOR said the man operated upon by Dr. Willard was in his employ. The urethrotomy was done on Tuesday afternoon and the man came to his work on Wednesday morning apparently perfectly well. He drove until 2 o'clock but was taken with a chill and fever in the afternoon. In the evening he became ill and was seen by Dr. Steele, who lived near his home, and sent to the hospital. Now a 28 French sound can be passed. The perineal wound is not yet skinned over but the man seems perfectly well and attends to his driving as usual.

BRADYCARDIA FOLLOWING HEAD INJURY.

DR. DE FOREST WILLARD reported the history of a man, 64 years of age, who was in good health until ten days previous to observation, when he had an attack of vertigo lasting but a few minutes, with no spasmodic symptoms. He was admitted to the Presbyterian Hospital November 21, 1905, with a slight scalp wound in the back of the head, reported to have been occasioned either by a brick having fallen upon him, or as believed by a fellow workman to have been occasioned by vertigo which had caused him to fall about four feet. Patient walked to the hospital, but while being dressed had a slight convulsion in which the face became cyanotic and was followed by snoring sleep of several hours but from which he could be easily aroused. Was dazed and slightly delirious for several days. There were no evidences of fracture; no paralysis; pupils slightly unequal for two days, afterward of same size. He lay most of the time with his eyes closed, quietly sleeping, but could be easily aroused and answered questions intelligently.

On entrance his pulse was 56, but fell steadily without diminution in volume until on the second day it reached 28; the fourth day 25; the seventh day 23; has continued in the twenties up to the present time,—*i.e.*, ten days. Respirations varying from 12 to 20; temperature 97. His arteries are very atheromatous, but he presents no evidence of valvular disease of the heart, although the muscle is weak. Heart sounds agree with pulse at wrist. Urine from 30 to 90 ounces daily. At first slight trace of albumen with a few casts; later, negative. Leucocytes 8000; hemoglobin 98%; red blood corpuscles 4,900,000.

The cause of this inhibition of heart action is difficult to explain and the point of interference with the pneumogastric or sympathetic is uncertain. He eats and sleeps well and appears to suffer no special inconvenience. Has no loss of motor or sensory power. As he had not been attended by any physician it is not known whether he had ever shown this slow pulse on previous occasions. Dr. Willard had never, save in opium poisoning, seen so slow a continuous pulse.

ASEPTIC FOREIGN BODY LEFT WITHIN THE CRANIAL CAVITY.

DR. JOHN B. ROBERTS reported the following case because of the unusual position in which a piece of sterile gauze was left after operation for trephining the skull.

A man was admitted to the Methodist Hospital on November 7, 1905, with a sinus above the right ear which was discharging a small amount of pus. He complained of severe headache, in the same region, and general convulsions accompanied by unconsciousness.

The history which he gave was to the effect that on July 1, 1905, he fell from the third story of a building, sustaining an injury to the head, for which he was subjected, in a hospital, to operation upon the skull. He was discharged cured in a month and returned to work. At this time he felt fairly well, although he complained of mild headache, progressive loss of hearing in the left ear and diminution of sight in the right eye. Two and a half months after the time of the original injury, he was struck upon the head in the region of the scar and promptly thereafter suffered an increase in the severity of the headache. In the course of a few days there was a discharge of a considerable amount of pus from a swelling at the region affected. The discharge of pus continued through the sinus left and was present when he came to the hospital for treatment. A week before his admission he had sharp pain at the site of the old scar, clinching of the hands and jaws and unconsciousness.

Examination upon admission showed a semilunar scar over the right ear and a sinus near the ear at the end of the former incision. There appeared also to be a slight discharge from the ear itself. The heart, lungs, liver and spleen showed on examination nothing abnormal. The reflexes were normal and the sensation unimpaired. Careful examination of the eyes and ears was not made at the time, because the patient's convulsions became so marked that Dr. Roberts proceeded to operation a day or two after his admission. The pain in the head and the convulsions were so severe, and the latter so frequent, that it seemed important to open up the sinus and search for a brain abscess rather than wait for extended study of the case. The region

affected was incised and developed evidence of a former trephining, and a sinus running into the cranial cavity. The opening, which was in the squamous portion of the temporal bone, was closed with thick fibrous tissue. A few drops of pus exuded from the fistulous tract, but no abscess cavity was found. There came to view, however, underneath the dura at the upper part of the trephine opening a piece of gauze, such as is used for packing wounds, firmly attached to, and interlaced with, the fibrous tissue. In order to withdraw this foreign body, it was necessary to cut out the mass of fibrous tissue which closed the opening in the skull and then cut away a portion of the bone at the upper edge of the opening. The original opening had been about $1\frac{1}{2}$ inches in diameter anteroposteriorly and three-quarters of an inch vertically. Careful exploration was made to see that no portions of gauze were left.

The wound was thoroughly cleansed and closed partially, but in a manner not to interfere with drainage. The dura, of course, could not be closed and it was necessary to provide drainage, because of the existence of pus before the operation was begun.

The plug of gauze removed was about the size of a hazelnut. It seems probable that at the time of the original operation, done by a surgeon in some other hospital, bleeding occurred and a piece of gauze was used to make pressure upon the divided vessel. It is evident that the operation was done with such aseptic care that prompt union without septic inflammation occurred. Whether the abscess, which subsequently occurred, was caused by the blow upon the side of the head received two months and a-half after the original injury, it is impossible to determine. From the short time after this injury that the abscess opened spontaneously, one would be led to believe that a chronic abscess had already formed before the blow upon the side of the head called the patient's attention to the matter.

Since the time that the gauze was removed, which is now about five weeks, the patient has had no special difficulty with the wound, except that he complains at times of pain in the head, and there is a protrusion of brain substance at the opening in the skull. This protrusion was to be expected, because there was neither dural covering nor bone over the brain at the site

of operation. It was impossible, and it would have been unwise, to cover in the opening in the calvarium.

The man has been irritable during convalescence and occasionally has violent convulsive seizures, clonic in type, accompanied with opisthotonos and pain in his head. The wound is in good condition; and pulse, respiration and temperature are practically normal. He is liable to get convulsive attacks and become excited, if he is kept in a ward with other patients or in a place where there is noise and confusion from people passing to and fro. When he has mild convulsions, which occasionally take place, the seizures are focal in type; the muscles of the neck pull his head to the right with the chin upward very much as if the spasm were in the left sternomastoid muscle; the head and eyes are deviated to the left without twitching of the face and eyes. At such times there is no involvement of arms, feet or legs in the convulsion. Recently he has been more apt to have the severe convulsions than the milder ones. In these there are clonic spasms of the extremities, with opisthotonos and violent shouting. The man is conscious and rational, except at the time of his convulsion. The convulsions, when severe, are described by the resident physician, Dr. Hall, as follows:—"The arms are sometimes extended, sometimes flexed, and shake with a fine tremor, being held quite rigid. The lower jaw is moved slightly up and down; the chin is rotated to the right and slightly elevated as if by action of the left sternomastoid. The eyes roll upward, sometimes looking directly upward, more often being deviated to the left. They are held immobile. In addition, the patient sometimes raises his hips up from the bed and rolls and threshes about, but the movements are in no definite order. They are such as any patient would show when suffering intense pain. After the convulsion is over the patient frequently complains of intense pain in his head and points to the right anteroparietal region." For a time these convulsions were very frequent and severe. Some of them are accompanied by vomiting, which occurred after the convulsion was over.

Large amounts of bromide potassium, some chloral, and hyoscine and codein have been used to quiet him. Occasionally it was necessary to confine him with straps or bandages. Chloroform has sometimes been given by inhalation to stop the convulsion.

The eyegrounds are apparently normal. There is no discharge from the ear. There are some casts in the urine. On account of the result of the recent urinary examinations, he has been given Basham's mixture as a diuretic.

The convulsions have seemed to be of a type which might, perhaps, be described as hystero-epileptiform.

THE EFFECTS UPON GLANDULAR TISSUE OF EXPOSURE TO THE X-RAYS.

DR. WILLIAM J. TAYLOR read a paper with the above title, for which see page 431.

DR. A. G. ELLIS said he had made no studies of X-ray tissue—those reported in the paper mentioned by Dr. Taylor. In the enormous literature which was accumulated, however, are many references to the untoward effect of this agent, and in the present state of our knowledge it should be used with caution. The numerous cases of sterility in X-ray workers reported by Dr. F. Tilden Brown are examples of its unexpected influence. The cases cited by Dr. Taylor further emphasize the necessity of careful and discriminate use of this illy understood force.

DR. JOHN H. GIBBON spoke of a case of enlarged cervical glands in which he had operated during the past summer. The patient in the spring had a prolonged treatment with the X-rays. The glands were most difficult to remove because of adhesions. It required two hours and ten minutes, with the help of an experienced assistant, to remove about thirty glands, whereas the next day twice this number were removed with the help of an inexperienced assistant in one hour. Every gland was so adherent that it required minute dissection to separate it from the surrounding tissues. It was impossible to remove the glands in a continuous chain.

It is regrettable that so many of the less radical measures which are employed in the treatment of surgical diseases cannot be used without interfering with subsequent operation, but yet this is a claim which is frequently made for them. No better illustration of this statement can be given than the difficulty encountered in operating for hernia where the injection treatment has been tried.

DR. RICHARD H. HARTE recalled a case of a child in which the cervical glands had been treated for some weeks with the X-ray, hoping by this means to avoid an operation. When, however, removal of the glands was attempted, the dissection was very difficult, as all the anatomical conditions were changed. The glands were adherent to the surrounding tissues, requiring forced dissection. In the course of a couple of weeks a small gland, which had been overlooked at the time of operation, broke down and suppurated. Dr. Harte is inclined to regard the use of the X-rays in cervical glands of the neck as most unsatisfactory.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, November 3, 1905.

The President, DR. D. A. K. STEELE, in the Chair.

PERFORATED GASTRIC ULCER.

DR. WILLIAM HESSERT reported two cases of perforated gastric ulcer and presented the patients.

CASE I.—D. H., aged 19, enjoyed good health up to seven years. From that time until fourteen she was in poor health. At fourteen the stomach symptoms began with pain in the region of the stomach; with vomiting, sometimes before, sometimes after, meals. She vomited blood. Her symptoms came periodically with remissions during which she felt fairly well and regained some strength. In June, 1903, she had a severe attack which was characterized by the sudden onset of severe pain in the left lower portion of the abdomen. This was so severe that she fell in a faint. She vomited. Pain was relieved after some hours, and subsided after three days. The abdomen became greatly distended; she was very sick for ten days, and was in bed about five weeks longer. After recovering from this attack, the periodical pain and vomiting recurred as before. Her general health was poor and she rarely felt really well.

July 5, 1905, at noon, she was seized with a pain again in the left lower quadrant of the abdomen. She had not yet had any dinner. Dr. D. E. Murphy saw her shortly after and found her in severe pain; shock; small, rapid pulse; cold extremities;

costal breathing; no vomiting; abdomen retracted and rigid. The whole left side of the abdomen was tender and the left abdominal muscles were tense. Morphine was given hypodermically. The speaker saw her at 8 P.M. in consultation. She had reacted somewhat; pulse still accelerated and small; slight rise in temperature. She had not vomited. Pain was somewhat relieved, but the abdomen was still tender and tense on the left side. She was put on rectal feeding and nothing whatever given by mouth. The pain subsided largely, and she felt fairly comfortable for two days, when pain increased and the abdomen became slightly distended. Her pulse and temperature went up to 114 and 101°, respectively. She was then removed to the Polyclinic, where she was operated upon sixty hours after the first onset of symptoms. A longitudinal incision was made to the left of the median line from the costal arch downwards, three inches in length. On opening the peritoneal cavity some turbid fluid escaped. The stomach was pulled out of the wound. A perforation was found on the anterior wall of the fundus near the lesser curvature. The opening was sharply outlined, and was one centimeter in diameter. The tissues for a distance of three centimeters around the opening were thick and indurated, and of a dark red color. There were no adhesions anywhere about the stomach. The stomach contents had evidently escaped into the subphrenic space, there being evidence of peritonitis here, but the cavity below seemed but slightly involved. The opening was first closed with through-and-through silk sutures. Some difficulty was encountered, owing to tearing through of the sutures. The whole involved area was then inverted with two rows of silk Lembert sutures. No other perforation was found, nor scars. The field of operation was then sponged out and two cigarette drains inserted and the wound closed in the usual manner.

On coming from the table the pulse was 120; temperature 100.8°. She vomited some dark fluid subsequent to operation. She was put on rectal feeding. She rallied nicely from the operation, and did not have a great deal of pain. On second day her temperature was 100°, and pulse 70 to 80. In fact, for a week after operation her pulse went down to 60, and became somewhat irregular. Bowels moved regularly. Wound draining freely. During the second week her pulse and temperature were about

normal. On the tenth day she was, for the first time, allowed fluids by mouth, liquid peptonoids being given. This agreed with her. On the twelfth day broth and peptonized milk were given. Nutritive enemas were continued as they were so well borne. On the fourteenth day toast, milk, ice cream, and oatmeal were given. On the sixteenth day egg and toast. At the end of three weeks her wound had completely healed. She was on a light diet, had no pain, and was digesting her food well. Bowels regular; patient feeling fine; weight 82 pounds.

November 3, 1905. Her present weight was 126 pounds, more than she had ever weighed before. Her health was fine. There were no gastric symptoms whatever. Patient able to eat all kinds of food without distress.

CASE II.—Female, aged 62. Gave a history of having had symptoms referable to the stomach for the last fifteen years. Pain came on periodically, lasting for a month or so, during which time she vomited blood. There were periods of remission for a few months, during which she felt fairly well, and enjoyed the usual nourishment. She gained some in strength; but after a while the symptoms recurred. There were pain and vomiting again. This condition persisted for fifteen years, when, last October, she was admitted to the Cook County Hospital to the medical service. Previous to this time she had been in bed for five or six weeks or more, and was getting weak; nourishment was poor; no appetite; frequent vomiting, and a great deal of pain. She was transferred to the surgical side at the beginning of December. Before that time she was considerably emaciated. An indefinite mass could be felt in the left hypochondrium. A probable diagnosis of malignancy was made, and an exploratory laparotomy performed. Dr. Hessert found the mass was situated in the region of the lesser curvature on the posterior surface of the stomach, and in pulling the stomach up and manipulating it, in order to determine its outline, suddenly gastric contents escaped, and he found there was a perforation. At the time, he thought perforation was due to manipulation, but later developments showed that it was not due to manipulation, but to an old ulcer which had perforated and had resulted in the development of a large mass of indurated tissue, a perigastritis. At the time of the operation a probable diagnosis of carcinoma was made, and after having sutured the

opening in the stomach, the abdomen was closed, with the belief that the case would take the usual course of carcinoma. In this he was agreeably disappointed, as the patient grew better, though very slowly. She vomited and was unable to take much food. But this mass steadily decreased in size, so that in May, some five months after the operation, the former tumor had entirely disappeared, and long before this time he made up his mind that the patient did not have carcinoma, but a chronic perforation of an ulcer in the posterior surface of the stomach. She had so much pain and was in such distress that he agreed to operate again in the hope of relieving adhesions or relieving her condition by some further procedure. Accordingly, a second operation was performed on May 13, of this year. Careful examination of the stomach failed to reveal scarcely any traces of the former lesion. There was absolutely no induration, but simply a small scar at the site of the previous perforation. There were considerable adhesions about the stomach and the latter was adherent to the abdominal wall, but still the old induration was gone, showing how such a chronic perforating ulcer, with perigastritis, may simulate a carcinoma. He decided not to do a gastroenterostomy, but simply to loosen up the adhesions, and since that time patient has regained her health fairly well, but not as completely as one would wish for. She had considerable pain now at times. She was able to eat everything at times, but at other times could only enjoy a little milk or liquid food. She has vomited blood since the operation; but there was no sign of a tumor mass present.

DR. L. L. McARTHUR stated that in the present trend of surgical opinion, when the pendulum was swinging in favor of gastroenterostomy for every ulcer or symptom of ulcer of the stomach, he felt that a word of commendation and praise was due to Dr. Hessert for his courage in withholding gastroenterostomy under the conditions which obtained in the first case. If one followed the book-lore, as now obtaining, the tendency was to simply make a puckering string suture of the perforation and do a gastroenterostomy. To do this in a patient suffering with peritonitis of an extremely acute type, entailed an added shock and risk to the patient, which, in his opinion, was not always necessary, and particularly not necessary where a perforation ap-

peared definitely in a large, single, indurated, round, perforating ulcer of the stomach. In such cases he believed the practice of Dr. Hessert to close the opening and be content with that for the time being, rather than to complicate matters by the addition of a gastroenterostomy, was the more desirable practice, although not that which was now taught. It did not complicate matters very much, before putting in a puckering string and Lembert sutures, to make an excision of the indurated edges, bringing more healthy tissue together, perhaps avoiding leaving behind cicatricial tissue, which pathologists were inclined to believe formed a basis for later possible carcinomatous development. This was easy of performance and supplied far better tissue for the stitches than that which was furnished when leaving this indurated base. Other things being equal, he would suggest the removal of that indurated base, bringing all the structures together as in a suture of a wound of the stomach. He believed, too, that the emphasis Dr. Hessert placed upon the appearance of pain laterally, either in the left or right flank of the abdomen, frequently obtained with perforation of the stomach and was due purely to the anatomical landmarks which guided fluids in the outer gutter along the right or left of the colon. The emphasis, too, which Dr. Hessert placed upon the avoidance of medication by the stomach, or the administration of emetics to clear out a supposed case of indigestion, was extremely desirable. The speaker recalled a case in which red pepper and ginger ale, to provoke emesis, given to a patient with gastric perforation, added tenfold to the amount of pain. Another fact which was extremely significant in acute perforations of the stomach, was the board-like rigidity of the abdominal muscles which the sudden gush of the infective material seemed to induce in perforation of the stomach, far more marked, he thought, than in duodenal perforation, and he was sure very much more marked than in the alkaline contents from perforation of the appendix.

DR. WILLIAM M. HARSHA was reminded of a case he saw recently. The patient was a woman of 60. She was taken with very severe agonizing pain in the right side in the subhepatic region. She was brought to Chicago, and he saw her about six days after the onset of the attack. There was a board-like rigidity of the abdomen, but it was not in the iliac region. It was

limited sharply to the right hypochondrium. A diagnosis of perforated gall-bladder was made by her physician. An incision was made over the site of the gall-bladder, and nearly a quart of fluid found here, circumscribed, which did not go below the colon or into the iliac fossa, but between the liver and chest wall, and was confined to that area. The anterior surface of liver was stained by fluids. The patient was profoundly toxic and went on to fatal termination.

HALLUX VALGUS.

DR. A. E. HALSTEAD showed skiagraphs of a case of hallux valgus before and after operating. He also exhibited the patient, and mentioned the method of operating, which differed a little from the ordinary routine followed by surgeons in general.

He mentioned briefly the opinion of the writers of the present time regarding the pathology of hallux valgus. Formerly the opinion of Virchow that the condition was essentially an arthritis deformans, was generally accepted. Of late years numerous writers have disputed this theory. At present it is generally considered as being static in origin, the change at first being due to ill-fitting shoes. The relative lengths of the great and second toes undoubtedly has a bearing on the early changes that take place. Those in which the great toe exceeds in length the second are more prone to this deformity than those having the toes of nearly uniform length. The narrow-toed shoes first cause an abduction of the great toe, producing a prominence of the metatarso phalangeal articulation. Pressure upon this prominence causes an inflammatory thickening of the soft tissues, especially of the bursa over the joint. Continuation of this pressure soon induces a periostitis with deposit of bone at the head of the first metatarsal. Abduction of the phalanx brings pressure upon the outer portion of the articulating surface of the metatarsal and produces in time distortion of the joint with atrophy or destruction of the articular cartilage, and hyperostosis of the inner surface where the pressure is lessened. The inflammatory process spreading from the compressed soft parts also plays a certain rôle in bringing about changes in the joint that closely resemble the changes found in arthritis deformans. He

stated that some writers laid stress upon the place of attachment of the extensor tendon of the great toe as a determining factor in the production of hallux valgus. Just how this factor was responsible for the deformity he was unable from his observation to state. He had observed that after resection of the head of the metatarsal and freeing the inner aspect of the joint of fibrous tissue, while the insertion of this tendon was undisturbed, it had a tendency to draw the toe outward, maintaining the deformity.

In operating for the relief of hallux valgus, he employed an incision, slightly curved, over the inner surface of the joint. The inflamed bursa was excised. The joint was exposed and the head of the metatarsal removed by means of a Gigli's saw. The extensor tendon was fastened well down on the inner side of the first phalanx without severing its attachment beyond. The posterior portion of the sheath was divided about $\frac{3}{4}$ of an inch proximal to the metatarso phalangeal joint, the sheath split and the reflected portion brought down and sutured between the cut end of the metatarsal and the base of the first phalanx. This supplied a new synovial membrane for the joint, and effectually prevented an ankylosis. The wound was closed, most cases without drainage. When there was suppuration about the joint previous to the operation drainage was employed.

The foot was dressed by incasing the inner half in a molded plaster splint; patient allowed to walk after the first day.

He stated that in a series of about 15 cases treated in this way the results had been uniformly good, the patients being free from pain and excepting when extensive infection before the operation had existed, there was freer movement of the joint. In none was there complete ankylosis.

DR. ALEXANDER HUGH FERGUSON said he had made a curved incision over the upper surface of the joint through the skin down to the fibrous structure, exposing the tendon; then a longitudinal incision on each side of the tendon liberates it, still leaving it in its sheath; a long incision on the inner side exposes the bones and joint; excision of the head of the bone very much after the manner mentioned by Dr. Halstead is now completed, leaving the sesamoid bone. He placed the internal lateral ligament as a fold between the bones and sutured it there with catgut. The tendon is free, and a good deal more extension than

was represented in Dr. Halstead's case is obtained. However, the result in Dr. Halstead's case was excellent, considering there was suppuration.

DR. CHARLES DAVISON questioned the necessity of putting fascial tissue in between the ends of bone where the articular surface of the phalanx was not interfered with. He had done the operation many times, cutting the distal part of metatarsal bone away carefully, leaving the articular surface of the phalanx, with the idea that there would be no adhesions, no ankylosis, if the articular surface was not interfered with. In quite a series of cases he had seen no trouble from ankylosis, and all of his patients had free motion when he saw them last.

DR. HALSTEAD, in closing the discussion, stated that in advanced cases the synovial membrane and the cartilage of the joint were likely to be destroyed, and one would find nothing but spongy bone. This was true in his case. He had had about fifteen cases that were treated by operation, and his experience and that of others was that ankylosis was almost the rule where there was no intervening tissue placed between the ends of the bone.

In a paper published in the *Zeitschrift für Chirurgie* quite recently, a large number of cases were reported which showed that ankylosis was invariably the rule, when resection of the joint alone was performed. If there was a normal articular cartilage to the phalanx, it would be all right; but in this case the cartilage was destroyed leaving only the articular end of the phalanx bare and eroded. He had tried subcutaneous connective tissue fat and it worked very well, but it was much more convenient to take a piece of tendon sheath to interpose between the joint surfaces. One could utilize a piece of tendon sheath with greater ease than he could take a flap from the under surface of the skin.

ACUTE POST-OPERATIVE DILATATION OF THE STOMACH.

DR. A. E. HALSTEAD read a paper with the above title, reporting a case following nephropexy.

The patient presented the clinical features and termination of a typical case of acute dilatation of the stomach following fixation of a movable right kidney in an apparently otherwise healthy young woman. The clinical diagnosis was verified at autopsy.

DR. ALEXANDER HUGH FERGUSON said he lost a patient from acute dilatation of the stomach ten years ago. The operation was performed for appendicitis between the attacks. After the anesthetic, the patient was in good condition; his pulse was good; temperature normal, etc. As far as the temperature was concerned, the patient had no rise of it at any time. He died on the eighth day with enlargement of the abdomen, persistent nausea, persistent vomiting, and increased dulness. Post-mortem examination revealed the stomach filling the abdominal cavity and protruding into the pelvis to some degree. The area of operation was normal. There was no peritonitis; no adhesions. Obstruction was found at the pylorus, and although one could pass the ring finger through the pylorus, still it was obstructed by being acutely bent upon itself. The duodenum was not enlarged, but slightly smaller than normal. If the obstruction were between the duodenum and jejunum, then there would have been dilation of the duodenum.

The next case was one in which he removed the cecum. Vomiting and dilatation of the stomach persisted after the third day. The stomach was washed out every three or four hours, but the man soon became tired of this and decided to lavage his own stomach, which he did, by placing his head down near the floor and a pillow under his stomach. This man is alive and well to-day. In addition to these two post-operative cases of acute dilatation of the stomach, he had had three others, two in children, and one in a man, from over-distending the stomach with food.

DR. E. WYLLYS ANDREWS said that he reported some years ago five cases of drowning in fecal vomit in cases of intestinal obstruction, and discussed at that time the peculiar mechanism of the accident. He was lead to infer that the two orifices of the stomach were dilated when this drowning took place, and the intestinal contents from reverse peristalsis poured through the stomach out into the throat. Only in that way could he account for the enormous quantity ejected in the fatal cases. Since he had heard Dr. Halstead's paper and the discussion, he thought these cases might have been instances of acute dilatation of the stomach.

DR. L. L. McARTHUR said he had learned his lesson in

regard to acute dilatation of the stomach through the death of a very dear friend who had been operated on for hysterectomy. The hysterectomy was made per vaginam. The patient developed no evidence of peritonitis, but had persistent nausea, with vomiting. Cases of acute dilatation of the stomach he believed were always associated with rather long intervals between the attacks of vomiting, then large quantities rather than frequent small quantities of fluid came away. The patient growing steadily worse, weaker and weaker, yet presenting symptoms which were to them intestinally obstructive in character, at three o'clock in the morning on the third day Dr. Frankenthal asked the speaker if he would not make an artificial anus to overcome a possible intestinal obstruction which might have taken place from adhesions down around the stump of the uterus, low down in the pelvis. To this he agreed, as it looked as if the patient were sure to die. He made a left inguinal incision, found a distended organ, very much like an enormously distended small intestine, but on endeavoring to raise it he found that it corresponded to the stomach. Pulling it out, he found it had the blood-vessels of the stomach, recognized it as the greater curvature of the stomach low down in the left iliac flank. Desisting from further operative interference, a stomach tube was passed and a gallon and a half of dark fluid removed. The incision was closed. We thought we had the case in hand, and that by passing a stomach tube on future occasions we would be able to prevent recurring dilatation of the stomach. The patient had one or two more periods of rest, but the stomach refilled, shortly after which she died. He thought in some cases it was not easy to differentiate between intestinal obstructive vomiting and that accompanying dilatation of the stomach.

DR. A. J. OCHSNER said that some time ago he directed attention to the fact that some patients upon whom gastroenterostomy or stomach operations of any kind had been performed died as the result of acute gastric dilatation. Several deaths had occurred before they had an opportunity to make an autopsy on one of these patients. Since then they had constantly watched this possibility of acute dilatation of the stomach, and had prevented it in several cases by having the patients sit up a few hours after the operation and making gastric lavage in case of any

symptoms. Last week a nurse reported in one case two days after a gall-bladder operation that there was something wrong, as the patient's temperature was not elevated, but at the time she reported this fact the pulse could not be counted. Dr. Ochsner found that the apex beat was very high; that the patient was suffering from dyspnea, and that she had the general appearance of a patient who was just about to die. He could not feel the pulse; the heart was simply fluttering. Having had this previous experience, and noting the position of the heart-beat and some abdominal distention, he simply introduced a stomach tube, when gas escaped with a good deal of noise, so that it could be heard all over the ward, and immediately the pulse went from 180 to 96. Distention of the abdomen with gas had displaced the heart. Had it not been for the fact of discovering the dilated stomach, he thought the woman would have been dead in another hour. He believed many patients died in that way, and that if one followed the rule of introducing a stomach tube when a patient was nauseated or complained of gastric distress after an abdominal section, a good deal of trouble and perhaps death could be avoided in a number of cases. This patient recovered.

CAPCINOMA OF THE APPENDIX VERMIFORMIS.

DR. JOHN L. YATES exhibited a specimen, which was removed by Dr. A. J. Ochsner from a woman, aged 75, two days previously. The diagnosis before operation lay between a neoplasm and an appendiceal abscess. Operation revealed both. The mass about the appendix was palpable through the abdominal wall, and at the time of the operation it was found that the sigmoid flexure had become adherent across the abdomen. A loop of ileum was also adherent, so that the removal required the excision of the loop of adherent ileum and the loop of adherent sigmoid flexure. Excision of the cæcum and distal end of the ileum, invagination of the ascending colon, and anastomosing the free distal end of the ileum into the upper portion of the rectum, with an end-to-end anastomosis between the severed ends of the loops of the ileum and the sigmoid. A satisfactory microscopic examination had not yet been made.

MALIGNANT GROWTH OF THE HEAD OF THE PANCREAS.

DR. E. WYLLYS ANDREWS showed a pancreatic tumor. A patient came under his care about a year ago with chylous ascites, due to a mechanical obstruction of the lymphatic system of the abdomen. He very early made out that the patient had malignant trouble presumably of the pancreas. Thinking it might be cystic or non-malignant, a laparotomy was made, which resulted in confirming the diagnosis of inoperable malignant growth of the head of the pancreas. The abdomen, therefore, was closed, the diagnosis having been easily made by the projection of the pancreatic growth between the stomach and the diaphragm (above the stomach). This patient had chylous fluid removed about seventeen times, and within three or four months afterward died of inanition, the specimen being secured by an autopsy. It showed the pathology very well. The solid mass—carcinoma—proved to be the head and half of the pancreas. Above it the stomach was already invaded by carcinoma; a small piece of liver tissue, which came away, was also invaded. The vena cava and aorta were adherent. The receptaculum chyli was entirely occluded, collapsed and pressed upon by the tumor mass.

INTUSSUSCEPTION.

DR. E. WYLLYS ANDREWS exhibited a specimen consisting of twenty-four inches of gangrenous intestine, which was the lower part of the ileum, and some living intestine attached, which was resected. This gangrenous intestine was removed a week ago by operation from a patient who had intussusception. Patient was a young, robust man, who, after jumping five or six feet down and lighting on his feet, began to have typical symptoms of intussusception. He was treated for a number of days, and then sent to the hospital. An immediate laparotomy was made by Dr. Andrews and twenty-four inches of the bowel was found invaginated, beginning some twelve inches above the ileocecal valve, so that portion of the intussusception had descended into the colon. At the time of the operation they retracted and brought out the full length of this intussusceptum, which was found to be gangrenous and putrid, decomposition having already set in. There was nothing unusual about the specimen

except after removing it the speaker found what he thought was the cause of the intussusception, namely, the presence of a pedunculated, fibro-papilloma, which hung by a pedicle four or five inches long, and had grown from the mucosa of the bowel for two or three inches up from the lower end of the intussusception. It was nothing more than one of those benign polypi which occurred in the bowel generally, and which the surgeon met with not infrequently in operating for hemorrhoids. They were pedunculated and attached themselves to the mucosa and simulated pile trouble. Occasionally they were of the nature of neuromata, but benign. This was like a cherry with a four-inch long stem. He did not discover this until he had removed it, and some time later had examined it. He was doubtful whether the pedunculated tumor was situated at the upper or lower end of the resected piece, but he thought it was at the lower end. The termination of the case was fatal. The omentum from which he dissected off this gangrenous loop of bowel was thoroughly thrombosed—bad looking. He observed thrombi in the radicles, of the veins extending off in some portions of the bowel which looked alive. In order to forestall extension of the gangrene, which would naturally follow thrombosis of the radicles in the mesentery, he removed quite a piece of living intestine. Not only did he do this, but stripped about five or six inches more of the intestine out through the abdomen, bringing it outside. The treatment of the distal or lower stump was simple, namely, cutting it off and invaginating it, going back almost to the cecum. Notwithstanding the removal of fifteen inches of the intestine which was actually dead, the patient was lost from perforation of the bowel a few days later, due to gangrene of the wall of the intestine, particularly that part of it still inside the abdomen, and leakage into the peritoneal cavity of some of the intestinal contents.

REVIEWS OF BOOKS.

ABDOMINAL OPERATIONS. By B. G. A. MOYNIHAN, M.S. (London), F.R.C.S., Senior Assistant Surgeon to Leeds General Infirmary, England. Octavo of 695 pages, with 250 original illustrations. Philadelphia and London: W. B. Saunders & Company, 1905.

Mr. Moynihan, in describing the preparation of the surgeon before operation in preantiseptic days, says that the operator felt adequately prepared when he had turned back the cuffs of his coat. The illustrations in the old works always depict the surgeon's cuffs and links; illustrations, mourns Mr. Moynihan, which are often borrowed and reproduced at the present time. However true this may be of the works of other authors and other publishers it is not true of the writer of "Abdominal Surgery" nor of his publishers. Considered merely from the typographical and artistic standpoint this book excels the older works just as much as the technique which it describes excels the clumsy methods of which they treated. When we compare the standard text-books of our time with the crude descriptions and illustrations of our student days we cannot but wonder at the successful work of our old teachers. Most works written twenty years ago are valuable now chiefly for their historical interest. One reads them with a serio-comic interest and a half pity for their readers, a certain degree of toleration for the publisher and artist. Kelly's "Operative Gynecology" set a new standard of excellence which publishers have been not slow to appreciate and adopt. This book of Moynihan is well clad, well printed, embellished with excellent half-tone illustrations, and worthily continues what the earlier work began. The text is concise but not abbreviated,

rich in descriptions of detail but not diffuse. The opening chapter contains much valuable and some new information on the bacteriology of the stomach and intestines. The statement that the *empty* stomach and intestine are sterile leads to suggestive reflection on the phenomena of fermentation in the alimentary canal from both the medical and surgical standpoint. The chapter is summarized in seven conclusions at its close, with some remarks on the sterilization of the whole tract. Under the head of preparation of the patient for operation the writer insists on the importance of thorough cleansing of the mouth as a preliminary to *all* operations. Most books restrict this suggestion to cases where the oral cavity is involved. If surgeons follow the author's advice it is not unlikely that the cases of postoperative pneumonia will diminish. We ought not to forget, however, the possibility that many cases of pneumonia of this class do not depend on a mouth infection at all but take their origin in the operation wound itself, being in the nature of infarcts, carried in the circulation from the wound to lung. The author devotes four hundred and sixty-six pages out of a total of six hundred and seventy to the consideration and description of operations on the stomach and intestines. It is hardly necessary to say that nothing of importance in this line of work has been omitted. The descriptions are clear but succinct and are well elucidated by the illustrations. Under the head of "Carcinoma of the Stomach" the statement is made that simple gastroenterostomy has a higher mortality than excision of the stomach which again has a mortality but little greater than that of exploratory incision. As a rule the operation of gastroenterostomy is done and will be done on cases in which excision is evidently out of the question, and such patients will always come to the operating table in worse condition than the earlier cases in which the complete operation can be done. As for the exploration, when the abdomen is closed without any further operative procedure it is because the conditions revealed are too desperate even for the

simplest measures of relief. These considerations should receive their due weight in estimating the relative actual mortality of the three operations. We can never know what the mortality of gastroenterostomy would have been if done in the cases of excision, nor of excision if attempted in the former cases. In the section devoted to operations on the intestines Chapter XX is taken up with the consideration of intestinal localization. Credit is given to Mall and Monks, and the latter is largely quoted. The succeeding chapters contain an account of intestinal sutures, not all of them, however, for which the reader should be grateful. The writer prefers the method of Connell. His opinion is that of many surgeons. The writer describes a method of suture of his own, but without illustration, which is to be regretted. A good illustration takes the place of a page of type and a good deal of pondering thereon. The chapter on intestinal obstruction contains much valuable advice. The author differs from many surgeons as to the advisability of administering morphine to these patients. Indeed he says "There is no absolute need to administer morphine; there is no justification for repeating the dose." Undoubtedly the use of morphine cannot have a curative effect in intestinal obstruction; nevertheless there are not a few conditions which simulate intestinal obstruction, and few operators would be willing to open the abdomen of a patient who was not vomiting who had little distention but much pain, not an unusual condition in obstruction, but one which obtains in other conditions not necessarily requiring operation, yet yielding to morphine. Of course no directions nor any number of maxims can supply individual judgment and the ability to nicely weigh the evidence on which diagnosis depends. On the other hand it seems to be going a little too far to advise that the drug shall not be repeated in the presence of certain symptoms which may or may not prove to be the result of an obstruction, and in which some delay is a necessary factor in diagnosis. Chapter XXXI treats briefly of the surgery of perforation oc-

curring during typhoid fever. Chapter XXXII deals with the subject of intestinal exclusion. The remainder of the volume is devoted to the surgical diseases of the liver, pancreas and spleen. The article on the pancreas and operations thereon is most complete. It is not too much to say that it is the most valuable treatise on this difficult and obscure branch of surgery that has yet been published. The chapters devoted to it form the logical and worthy culmination of a work which is a distinct addition to the library of every surgeon.

ALGERNON T. BRISTOW.

APPENDICITIS. By JOHN B. DEAVER, M.D. Third Edition. P. Blakiston's Son & Co. Philadelphia.

In this, the third edition of Deaver's treatise on Appendicitis, the author has produced a most attractive work which embraces this ever-interesting subject from the first days of its recognition up to the present time. In a careful review of its pages, one finds a complete and exhaustive study of every phase of this many-sided disease, comprising the combined ideas of almost every author of note who has contributed to the literature of the subject. In the main, however, the work is based on the writer's personal experience, which now includes several thousand cases. It is a notable fact, as Deaver points out, that most of the good work along the lines of diagnosis and technique of operating in appendicitis has been done by English and American surgeons.

A chapter of great interest is the one on "The Function of the Cæcum and Appendix." In this the experiments of Macewen are cited, which demonstrate the important rôle played by the appendix in the process of digestion, in that it supplies a goodly quantity of the succus entericus, the glands of Lieberkühn being much more numerous in the appendix and cæcum than in the small intestine.

The chapters on Diagnosis and Treatment together with

Operative Technique are all that could be desired, giving expression to everything that is modern and generally accepted by the surgeon of the present time. The plates illustrating the various incisions and methods of ligation and dealing with the stump are instructive and artistic. The author, as may be supposed, has made certain radical changes in his views on abdominal section in the presence of general peritonitis, notably in the technique of operation and the question of drainage. Several new chapters have been added, including one on "The Blood-Count in Appendicitis" and another on "Typhoid Appendicitis." There are in all sixty-four excellent plates, of which forty-two are new. A bibliography is appended.

WALTER A. SHERWOOD.

A PRACTICAL TREATISE ON SEXUAL DISORDERS OF THE MALE AND FEMALE. By ROBERT W. TAYLOR, A.M., M.D. Third Edition.

The third edition of this excellent work has been enlarged and improved in many ways. It is to be commended for its clear and simple method of dealing with this most difficult and troublesome class of cases. The book emphasizes the fact that intelligent and successful treatment can only be undertaken when the underlying cause of the disease is clearly understood.

HOMER E. FRASER.

DISEASES OF THE SKIN. By GEORGE THOMAS JACKSON, M.D., Chief of Clinic and Instructor in Dermatology, College of Physicians and Surgeons, Columbia. Fifth Edition. One 12mo. volume; 676 pages. Lea Brothers & Co., Publishers, Philadelphia and New York.

As in his former editions, the author has adhered to his scheme of alphabetical arrangement of the diseases, which renders its contents quickly accessible to either physician or student.

To the present volume there have been added several new sections, chiefly varieties of acne, among which the form

Telangiectodes is the only practical one, also several erythematous and granular conditions.

The author has written on this confusing subject clearly and concisely, giving symptomatology, diagnosis and treatment in a manner easily grasped. The text is well illustrated by engravings and several colored plates. One of the most pleasing features probably is the appendix, which contains formulæ for the various baths, lotions, powders, ointments, etc.

JAMES TAFT PILCHER.

CHIRURGIE OTO-RHINO-LARYNOLOGIQUE (Ear, Nose, Sinuses of the Facial Bones, Pharynx, Larynx and Trachea). By GEORGE LAURENS, Formerly Assistant in Oto-rhino-laryngology in the Hospitals of Paris. 8vo., pp. 976. G. Steinhil, Paris, 1905.

This treatise forms a large volume, most attractive, typographically. It is profusely illustrated. The claim of the publishers that it is the most complete work on the subject which has yet appeared seems to be a just one. The delineation by clear and correct cuts of the successive operative steps demanded in the various operations described is one of the most noticeable and valuable features of the book. The book, as a whole, well presents the extensive operative field which the surgery of that portion of the body to which it is devoted has come to involve. The treatise is divided into the five parts—The Ear, the Nose, the Sinuses of the Face, the Pharynx, the Larynx, and the Trachea. The plan of the writer is to first describe the method of examination and exploration of each organ whose surgery is to be treated of; then to discuss the various processes of local treatment applicable; in connection with which latter he dwells fully upon considerations pertaining to illumination, of anæsthesia and of hemostasis involved in each of the craniofacial cavities.

The manner in which middle-ear suppurations are treated is especially noteworthy for its comprehensiveness and complete-

ness. The modern radical mastoid operations, the surgery of the lateral sinus, otogenic abscesses of the cerebrum and of the cerebellum, and purulent meningitis are each clearly discussed and the possibilities of relief by opening the skull are studied. The results of the involvement of the facial nerve are also analyzed.

Larngo-tracheal surgery concludes the work, occupying two hundred pages,—Tubage of the Larynx, Laryngectomy, Tracheotomy, Tuberculosis of the Larynx, Foreign Bodies in the Air-passages—these are chief among the topics discussed in this section. Each topic is treated with much fullness of detail, and the book, as a whole, which forms a part of Berger and Hartmann's *Traité de Médecine Opératoire et de Thérapeutique Chirurgicale* may be accepted as representing in its department the teachings of French surgery of the present day.

LEWIS S. PILCHER.

DIE VERWUNDUNGEN DURCH DIE MODERNEN KRIEGSFEURWAFFEN.
VON STABSARZT DR. HILDEBRANDT. Berlin. 1905. August
Hirschwald. [Wounds from Modern Military Firearms.]

This work of 280 pages presents a very practical discussion of the wounds of modern small-arms in warfare, their prognosis and treatment in the field. The experience of the author as staff surgeon in the German army, and as surgeon with the troops in the Boer war and in the Chinese expedition of the allied armies, has given him authority and experience for such a work. It is well illustrated, and embodies the most advanced information upon this subject.

J. P. WARBASSE.

THE SURGICAL ASSISTANT. By WALTER M. BRICKNER, B.S.,
M.D. 1905. International Journal of Surgery Co. New
York.

This is a manual for students, practitioners, hospital internes and nurses.. It tells how to assist the surgeon. It is eminently practical, and shows that it has been compiled from the surgical

experience of the author. It makes for system in surgical work and should be read especially by hospital internes. It is well illustrated and fills an important place in surgical literature.

J. P. WARBASSE.

CLINICAL DIAGNOSIS. By RUDOLF VON JAKSCH, M.D., Professor of Special Pathology and Therapeutics, University of Prague, etc. Fifth English Edition from the Fifth German Edition, Amplified and Edited by ARCHIBALD E. GARROD, M.D., etc., Lecturer on Clinical Pathology at St. Bartholomew's Hospital, Etc. Pp. 602. Illustrated, partly in color. London: Charles Griffin and Co. Limited. Philadelphia: J. B. Lippincott Company. 1905.

The fifth edition of Professor von Jaksch's "Clinical Diagnosis" in no wise falls short of the high standard set by the previous editions of this well-known book, nor has it lost anything by the death of its former translator, whose place Dr. Garrod has so ably supplied. The work has so long been a standard that little need be said by way of review. One need not eat a whole cheese to judge of its quality and a liberal taste here and there satisfies one of the excellence of "Clinical Diagnosis." One can find flaws, and perhaps a fair criticism is the rather brief mention accorded to the methods of staining blood-smears, especially for detecting the malarial parasites. The very convenient methods for using the various modifications of the Romanowsky stain, especially that of Wright, are not even mentioned. Neither is the Leischman-Donovan blood-parasite recorded, although trypanosomes are fully treated of. Urine is very fully considered, a new form of cast consisting of red blood-cells adherent to very large cylindroidal masses and occurring in occlusion of the renal artery being pictured. Intestinal parasites are very fully described and the chapters on the feces, stomach contents, sputum, and others, are excellent.

HENRY GOODWIN WEBSTER.

METHODS OF MORBID HISTOLOGY AND CLINICAL PATHOLOGY.

By I. WALKER HALL, M.D., Lecturer and Demonstrator in Pathology, Victoria University, Manchester, Etc., and G. HERXHEIMER, M.D., Prosector to the Städtisches Krankenhaus, Weisbaden. Pp. 290. J. B. Lippincott Company, Philadelphia. 1905.

The authors of this eminently useful handbook have succeeded in supplying what every laboratory worker as well as the occasional observer will at once recognize as a very desirable addition to his armamentarium—a compendium of histological, pathological and bacteriological technic. They have gathered together in compact and accessible form a very considerable number of formulæ for the preservation, preparation, cutting, staining and examination of tissues and organisms as well as careful directions for preparing the various reagents. They have carefully arranged and systematized this large mass of technical information which ordinarily has to be sought for scattered through text-books of clinical and microscopical diagnosis or in monographs not always easy of access. Their method of grouping the necessary steps in preparing material into chapters devoted to the separate processes is clear and commendable, while the hints as to those methods that their own experience has approved will doubtless be helpful to the more inexpert. Those of broader experience, too, will find a sufficient variety of methods and formulæ to suit their individual choice. An extensive bibliography shows the care that has been taken in compiling the book and will be helpful to the investigator who desires to study the original methods for himself. Hints as to where apparatus and materials may be obtained, while valuable for English readers, will hardly prove interesting to American students. Altogether the book can be heartily recommended to all who are working in laboratory diagnosis.

HENRY GOODWIN WEBSTER.

PRINCIPLES OF BACTERIOLOGY. Seventh Edition. By A. C. ABBOTT, Professor of Hygiene and Bacteriology, Director of the Laboratory of Hygiene at the University of Pennsylvania. Lea Brothers. 1905.

The latest edition of Dr. Abbott's Bacteriology has been revised and brought up to date in its subject matter by the elimination of many of the more infrequent organisms and the addition of newer ones with the improved cultural diagnosis.

Of particular interest in the latter groups are the paratyphoid and para-colon groups of organisms which have recently attracted attention by their isolation from clinical typhoid fevers.

The *Bacillus Dysenteriae* group has also been modernized, with the newer methods of isolation and identification of these closely allied organisms. In addition the antitoxins of this group have been discussed, with the clinical results of its application in infections from this source.

The greatest interest of this volume aside from its careful exposition of the various laboratory methods in the culture diagnosis, and activities of the various bacteria lies in its chapters on infection and immunity. The vast amount of literature which has been published on this subject has been carefully reviewed, and the results of the many investigations and researches are tersely set forth in such a manner as to be readily understood by every student of medicine.

The chapters alone stamp the volume of such merit as to be designated one of the best of the briefer bacteriologies.

FRANK ERDWURM.

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ORIGINAL MEMOIRS.

THE VALUE OF THE DIFFERENTIAL LEUCOCYTE COUNT IN ACUTE SURGICAL DISEASES.¹

BY CHARLES LANGDON GIBSON, M.D.,

OF NEW YORK,

Attending Surgeon to St. Luke's Hospital.

THE systematic examination of the various elements comprising the white cells of the blood, the so-called "differential count," has been extensively used in the last two years in the surgical clinics of this city. These researches have been particularly on the increase of the polynuclear cells in inflammatory conditions, especially in disease of the appendix and its sequelæ.

Material for this paper has been furnished chiefly by blood examinations made in my service at St. Luke's Hospital during the year 1905. A very few examinations date back to 1904; and by the kind courtesy of my colleagues Dr. Robert Abbe and Dr. Farquhar Curtis, enough counts have been added to raise the number to about two hundred examinations.

The differential counts are made by the *personnel* of the Pathological Laboratory of St. Luke's Hospital, which is admirably conducted by Professor F. C. Wood; and there is every

¹ Read before the New York Surgical Society, January 24, 1906.

reason to believe that these examinations are made in the most approved manner, and that they are thoroughly reliable.

Although so much material must now be available, little or no attempt has as yet been made by the surgeon to draw practical deductions from such data.

The most satisfactory contribution to the subject is the paper of Dr. F. E. Sondern, "The Present Status of Blood Examinations in Surgical Diagnosis,"² which puts the subject on a thoroughly practical basis.

The reason so little authoritative comment on the value of this method has been made is doubtless a more or less general impression that the findings are merely an elaboration of the leucocyte count rather than, as I hope to demonstrate, a quite different and much more important element.

When the differential count first began to attract interest, the value of the ordinary leucocyte count had become much discredited by many, perhaps most, surgeons. This distrust was certainly felt by the writer, who had ceased to pay more than a minimum of attention to such findings.

Even as recently as September, 1905, one gets from the report of the First International Congress of Surgery, at which examination of the blood was made a major subject, nothing of the importance of the new investigation, it being mentioned only casually, and with no attempt to emphasize its special features.

Just as the original leucocyte count had its pitfalls, the differential count, it must be admitted, has its individual drawbacks. It needs, even more than the older method, a considerable knowledge of the subject and ability to interpret judicially the several pathological variations. This knowledge, however, can be applied much more surely, with fewer mistakes and far greater positive and helpful results.

The value of this method depends not on the significance of any given quantities, X or Y representing the number of the leucocytes or of the polynuclears. It does not depend at all

² Medical Record, March 25, 1905.

on the absolute percentage of the polynuclear cells, a method almost as valueless as the leucocyte count alone, but on the *relative proportion* of the polynuclear cells to the total leucocytosis.

To understand this relation, it is necessary to consider very briefly some elementary facts and also the standard which the writer has adopted in studying the results of the differential count.

Normal Leucocytosis.—Variable quantity, influenced by age, variations in habit, time of day, food, exercise, etc. Average varies, according to different authors. Sondern gives the average as 6700. The writer has thought it wise to consider 10,000 as the extreme limit of ordinary normal leucocytosis, believing that this estimate will correct errors of idiosyncrasy, etc.

Hyperleucocytosis, then, would mean counts in excess of 10,000.

Hypoleucocytosis is still harder to determine and without special reasons should not be so considered except distinctly under 5000, with a considerable reserve for personal idiosyncrasies. The surgeon is generally more interested,—certainly in acute inflammations,—in an *increase* rather than a decrease of leucocytosis.

Leucocytosis in inflammation is an index of reaction rather than of the absolute severity of the particular kind of infection.

As we shall see later, there are a number of fatal cases with a distinct lowering of the leucocytosis.

Sondern says: "Leucocytosis is largely dependent on body resistance towards infection, and therefore the degree of increase can be no guide to the intensity of the pathological process. Good resistance will produce pronounced leucocytosis even in slight infections, and poor resistance but little leucocytosis in slight infections and possibly none at all in grave infections. No adequate clinical method exists by which this body resistance can be determined with sufficient accuracy to apply it as a factor to the leucocyte count; and this is the key

to the disappointment encountered by the surgeon in utilizing these counts in diagnosis."

What is the normal proportion of polynuclear cells?

The normal ratio is again estimated differently by various authors. Sondern's average is 68 per cent. Most authorities put it somewhat higher. Von Lembeck, quoted by Cabot, puts it at 70 to 80.

The writer has thought it wise, as in the case of the leucocyte count, to adopt the rather higher average corresponding perhaps more accurately to what is called hyperleucocytosis, and has adopted 75 per cent. as a working average.

In infancy there is a very marked diminution of the proportion of polynuclear cells, said to be from 28 to 40 per cent. The writer's cases show in infants with pathological conditions a strikingly low polynuclear count,—*e.g.*, child of six weeks, fatal intestinal obstruction, total leucocytosis 16,200 per cent., polynuclear cells, 14. Child 1 year, acute otitis media, total leucocytosis 13,300 per cent.; polynuclear cells, 31.

The Behavior of the Polynuclear Cells; Cells in Acute Inflammatory Conditions.—Generally speaking, there is a rise in the percentage of the polynuclears which is a fair index of the severity of the process, but it must be strongly emphasized that it is *per se* far from being an absolute guide; for if we should rely *alone* on the increase of the polynuclear cells, we should have but little more information than was furnished by the older method. For it must be remembered that we may have,—even though it be rare,—a very high percentage of polynuclear cells without a very serious or fatal result. Sondern says in his experience more than 94.5 was always fatal.

Personal experience furnishes a notable exception. Man, age 74, advanced tuberculosis of the testicle; per cent. polynuclear, 97.5. A case of gangrenous appendix, very ill, was saved by operation; polynuclear 94.5. A case of "catarrhal appendicitis," recovering without operation; leucocytosis, 20,600; polynuclear, per cent., 94.

As a matter of fact, a very high percentage of polynuclear

cells (infants not computed) is not the rule in fatal cases as the average in these recorded cases was: Total leucocytosis of 13,000, per cent. polynuclears, 82.9; showing a disproportion of five counts in the "standard" chart.

Some instances of low polynuclear per cent. in fatal cases: Gangrene of the lung, 57 per cent.; pyemia, 67; general peritonitis, 69.

Dr. Sondern's findings are: "In adults a purulent exudate or a gangrenous process is decidedly uncommon with less than 80 per cent. of polynuclear cells, and the probability of their presence increases with their percentage."

While admittedly true, this statement has too many exceptions not to call for some special comment, as may be noted from the following cases: General peritonitis, 69 per cent.; general peritonitis, 75 (two cases) appendicular abscess, 77; pyosalpinx, 76; pyosalpinx, 75½; gangrene of skin, 59; gangrene of leg, 75; abscess of lung, 57; acute pelvic abscess, 66.5; ischiorectal abscess, 77; pyemia, 67; perinephritic abscess, 72; acute suppurative nephritis, (three counts,) 68, 55, 62.

So that we must look further for some value inherent to the polynuclear count than the mere degree which it may attain. Its real value in the writer's judgment is to be found in another and distinct feature, viz., *the relative disproportion of the polynuclear percentage to the total leucocytosis*. This is the feature which Dr. Sondern has so clearly pointed out, and constitutes the chief topic of the present contribution.

In this matter, the question of body resistance, necessarily conjectural, must be taken into account; but it is probably more clearly defined by this disproportion than by any means at present in our command.

The writer's experience and observation lead him to believe that with a moderate use of the total leucocytosis there should be in favorable cases a moderate rise only of the polynuclear cells, showing that the infection is localized and absorption is limited.

On the other hand, if there is only a moderate leucocytosis

with a *notable increase* in the polynuclear cells, it indicates almost unquestionably that there is either a severer form of lesion or that there is less resistance to absorption, or that both of these conditions exist.

As examples of good resistance (see chart) the following examples may be quoted:

	Leucocytosis.	Polynuclear, percent.	
1. Appendicular abscess,.....	14,000	77	
2. Appendicular abscess,.....	18,000	78½	
3. Acute appendix,.....	20,000	78	
While as examples of a severe lesion (note steep line of this second group rising from the leucocyte side of the chart to the polynuclear side):			
4. Acute gangrenous appendix.....	4400	81	Died
5. Acute appendix and general peritonitis,	10,600	83	"
6. Intestinal obstruction,.....	7400	81.5	"
7. Septic endometritis, general peritonitis,	17,800	97.5	"
8. Gangrenous appendix,.....	9500	94.5	Cured
9. Appendicitis, general peritonitis,....	13,200	86	Died
10. Septic endometritis, general peritonitis,	14,000	91.5	"

This *disproportionate* increase of the polynuclears is on the whole more reliable than any of the other data, and has served greatly to influence the writer's work in the past year. The exceptions have been few; in no case has he actually been led astray, though occasionally the lesion has been of lesser severity than anticipated. There is, however, a good deal to be said on this last point, particularly on the important subject of appendicitis. We operate now usually so promptly that we find the lesions relatively less advanced than formerly, while some of these seemingly mild processes may potentially have the worst possibilities. My colleague, Dr. Curtis, for instance, informs me that he removed a rather mild-looking appendix that was productive of very acute symptoms and a high differential count, but inoculations from the contents of the appendix yielded a virulent culture of streptococci.

TOTAL LEUCOCYTES

PER CENT. POLYNUCLEARS

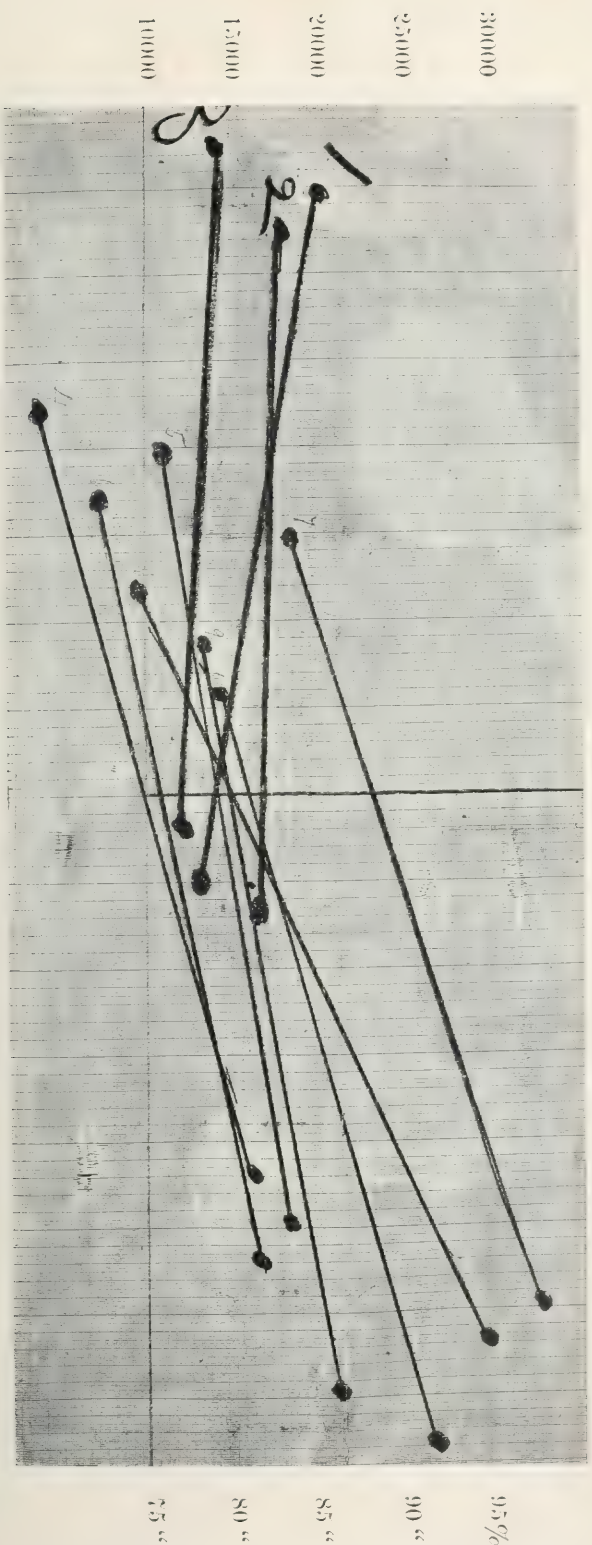


CHART 1.

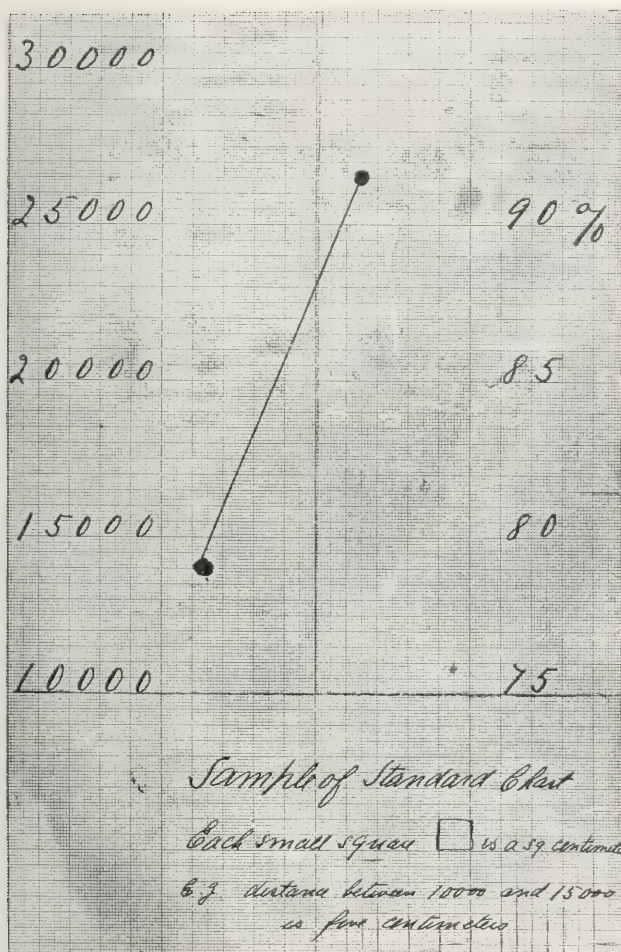


CHART 2.

LEUCOCYTOSIS

POLYNUCLEARS

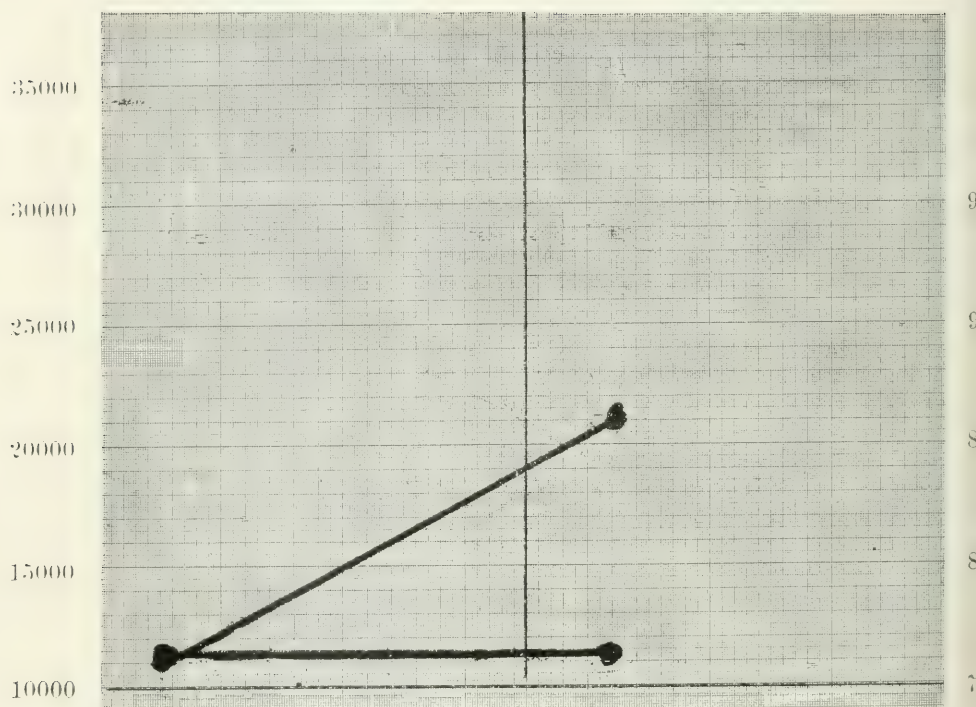


CHART 3.

What shall be the standard by which we shall gauge various degrees of disproportion between the leucocyte count and the percentage of polynuclear cells? As we have no definite means of measuring body resistance, it is necessary in the present state of our knowledge to resort to avowedly arbitrary standards.

It has seemed to the writer that in inflammations which are well resisted, the polynuclear cells are increased approximately one degree for every one thousand of the total leucocytosis above ten thousand. Starting with such a basis, experimental charts have been worked out and the results seem on the whole to show that such a standard forms a very good working basis for the measurements which have been adopted by the writer. (Chart II.)

Description of the Standard Chart.—The chart is divided into units of one centimetre allowing an easy and practical computation of the results. A horizontal base-line is drawn as the starting point of the pathological leucocytosis of ten thousand on the left-hand side, while the other or right-hand end of the base-line corresponds with the index of 75 per cent. polynuclear cells, the limit more or less arbitrarily chosen. Variations in these proportions are indicated by making a dot at the proper level of the left-hand or leucocytosis side of the chart, while a similar dot at the proper level of its percentage is made on the polynuclear side of the chart. For purposes of convenience these two dots are connected by a straight line. The vertical distance between the two dots will represent in the accepted counts (one centimetre) the disproportion between the two counts. (Chart III.)

E. g.—suppose on the left a dot indicating a leucocyte count of 11,000 and on the right a dot indicating 76 per cent. polynuclear cells, the result would be indicated by a line which would be absolutely horizontal, and would be indicative of a just proportion between the two elements of the count.

If, however, with the same leucocytosis of 11,000 there were a polynuclear increase to 86 per cent. the line connecting

these two points would have a steep rise from left to right and measurement of the vertical distance between these two points would give ten centimetres or ten units.

Thus we have something definite to compute, and we could speak of a five unit or a ten unit or a fifteen unit disproportionate increase or decrease of the polynuclear cells.

Such a chart moreover is particularly useful in continued examinations from day to day, as the fluctuations can be readily read and expressed in definite counts, such accurate comparisons being lacking heretofore.

If a large number of observers would collect extensive data by using such a standard chart, utilizing these units to record their findings we might hope eventually to strike working averages and standards on which to base future observations.

The writer feels that it would be presumptuous and unsafe to attempt as yet to lay down any rules from his limited findings with such a chart.

He hopes, however, that others may be encouraged to adopt the standard which is hereby tentatively offered, and, it is hoped, improve on it.

Speaking very generally and with considerable reserve, the writer attaches already considerable significance to the findings which some of these charts have shown.

If the line connecting the levels of the leucocyte count and the polynuclear count runs pretty nearly horizontal, whether up or down, only 2 to 4 units difference, it indicates a lesion that whether severe or not, is well borne and therefore of a good prognosis.

Lines running *upward* from the leucocyte side towards the polynuclear indicate in general a rather severer lesion and less resistance. If the interval between the two points is considerable, say ten or more units, we are quite sure to have a pretty severe lesion. The majority (about $\frac{2}{3}$) of total cases of all kinds show a rising line, and as we shall see later in such a condition as appendicitis, fatal cases have *all* a rising line. (Chart IV.)

LEUCOCYTOSIS

POLYNUCLEARS

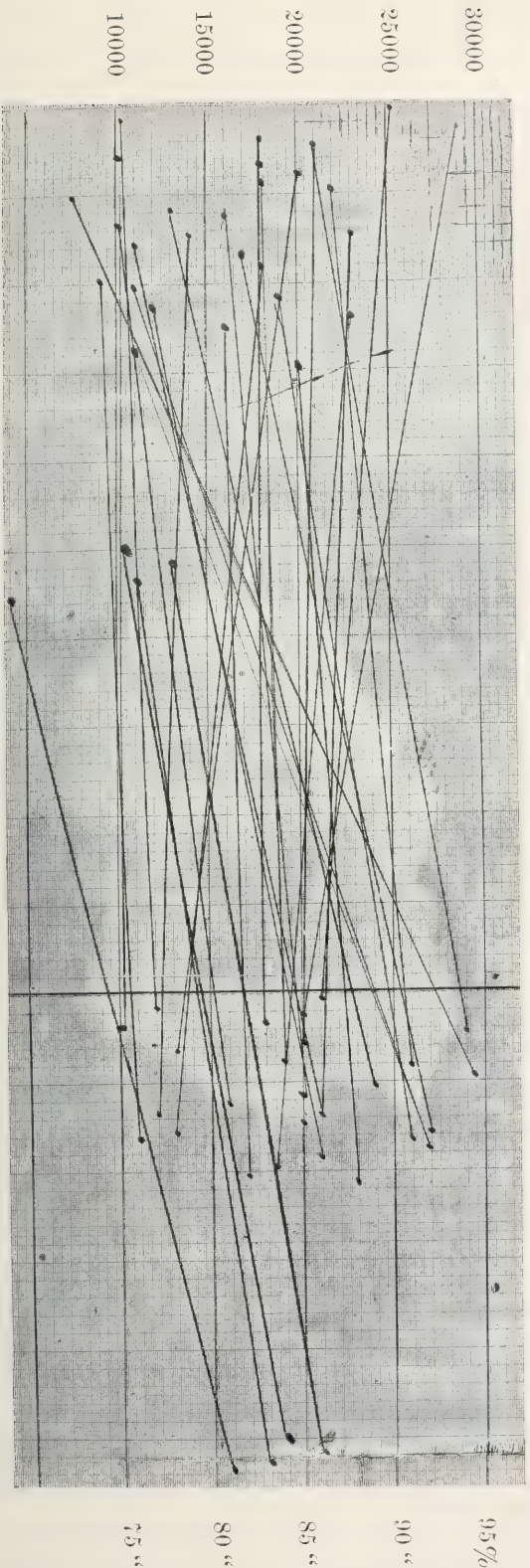


CHART 4.—Acute Appendicitis.

THE DIFFERENTIAL COUNT IN SPECIAL CONDITIONS.

Appendicitis.—In twenty acute cases a *distinct* disproportionate increase of the polynuclears indicated by a *rising* line was manifest.

In two cases the line was very nearly horizontal, showing a good balance between the two elements.

In three cases there was a distinct downward tendency of the line, showing preponderance of leucocytes.

These results seem to show a positive value for the differential blood-count as estimated by the standard chart.

There was one exception: Mild case of catarrhal appendicitis, allowed to convalesce without operation. A single examination showed leucocytosis 24,600; polynuclear, 94 per cent.; giving a rise of four units.

ALL the severer lesions, those with gangrene of the appendix or progressive peritonitis, and *all* the fatal cases, showed a *rising* line on the standard chart, while all the cases indicated by a falling line were distinctly mild types such as well-defined "safe" abscesses with little febrile or constitutional disturbances. As it is in the severer cases, particularly those in which the initial symptoms are obscure or perplexing, that we can least afford to make mistakes, the great value of the polynuclear increase is evident, as the findings on these cases will hardly ever lead us astray.

A case of this nature first definitely called my attention to the value of the method in question:

Man 28, who for twenty-four hours had had a chain of acute abdominal symptoms, obstinate vomiting, general abdominal pain, moderate rise of temperature and pulse; looked sick. Examination of the abdomen quite negative as regards ordinary signs of appendicitis. A little tenderness just above the pubes was noted, but it was said to be habitual. Rectal examination elicited some tenderness on pressure against the posterior wall.

Differential count by Dr. Sondern: Leucocytosis, 22,800;

polynuclears 88 per cent. When seen six hours later, general remission of all symptoms, felt and looked better.

Strengthened by Dr. Sondern's personally expressed opinion. I had made a diagnosis of gangrenous appendix which was probably permanently fixed in the pelvis. The patient was immediately taken to St. Luke's Hospital, but two of the best consultants failing to confirm my views; operation was deferred for twenty-four hours, by which time the condition was obvious. Operation showed great meteorism, general reddening of the intestine, a little turbid serum and finally a gangrenous appendix in the pelvis. Death from progressive peritonitis.

The above experience, so far as the correctness of the findings is concerned, has been frequently repeated, and did space allow many similarly impressive instances could be cited.

The importance of a disproportionate increase of the polynuclears (rising line on the chart) particularly if progressive, cannot be overrated, and those wilfully disregarding such evidence are perhaps not exhausting all resources of diagnosis.

If one examination in a threatening case of appendix shows for example 15,000 leucocytes and 85 per cent. polynuclears, a difference of five units by the "standard" chart, and a second later examination shows the same leucocytosis with a *rise* of the polynuclears to 87 per cent., the condition must be regarded as considerably worse, both as regards the increasing severity of the lesion and the diminishing ability to withstand it.

Chronic Appendicitis.—These cases of interval operation showed on the whole little leucocytosis and practically no disproportion on the chart, viz.: Five cases showed a falling line on the chart; five cases showed a stationary line or an insignificant rise.

Female Genitalia.—The differential in pyosalpinx:

	Leucocytosis.	Polynuclear, percent.
1.	22,300	87
2.	12,000	76
3.	8700	75.5

	Leucocytosis.	Polynuclear, percent.
4.	11,000	82.5
5.	15,000	76.5
6.	8000	66.5
7.	13,600	81.5
8.	16,400	88
Average percent. polynuclear,.....		77.5
Septic endometritis,.....	17,800	97.5 Died
Septic endometritis,.....	12,000	75 Cured
Septic endometritis, general peritonitis.	21,800	91.5 Died

The differential count in pyosalpinx was absolutely consistent. The chronic cases with little temperature showed an average of 70-75 per cent., the acute cases a little over 80 per cent. None reached any of the extreme ranges which would have been inconsistent with such a well-limited inflammation, while in the case of septic endometritis peritonitis there was attained the maximum polynuclear count 97½ per cent., which with a leucocytosis of 17,800, gives a disproportionate increase of polynuclears of 16½ units, which speaks eloquently for the prognostic significance of these examinations and the method of computing these results.

Intestinal Obstruction and Cases of General Peritonitis.—Eight cases; one recovery. Average disproportionate use of polynuclears was 7³/₁₀ per cent. a high count whose value is self-evident.

Tuberculosis.—It is stated by some that there is a decrease, absolute and relative, of the polynuclear cells in tuberculosis. The writer's findings do not generally substantiate such views, the percentage of the polynuclears being generally a rising one.

	Leucocytosis.	Polynuclear, percent.
Tuberculosis of the peritoneum.....	8,800	86
Tuberculosis of the peritoneum.....	1,900	82
Tuberculosis of the spine.....	22,000	81
Tuberculosis of the hip.....	3,200	68
Tuberculosis of the kidney.....	23,200	72.5
Tuberculosis of the kidney.....	21,000	84
Tuberculosis of the testicle.....	23,000	97½

This last polynuclear increase of $97\frac{1}{2}$ is the largest occurring in the series, it being also observed in a case of fatal septic endometritis. Only once has the author noted a higher percentage, a case of suppurative meningitis, $99\frac{1}{2}$, quoted by Cabot.

Biliary Tract.—Observations as regards reaction to gall-stones without infection showed only negative data, while in two fatal cases of empyema of the gall-bladder there were rises on the standard chart of four units in one case and five and a-half in another case, those findings being particularly significant. The patient was extremely ill. The huge suppurating gall-bladder was easily and quickly shelled out of its bed without contamination of the wound, which was liberally packed and left open. The septic manifestations, however, continued to increase, although an autopsy disclosed an irreproachable condition of the site of the operative manipulation. In this case the increased proportion of the polynuclears $91\frac{1}{2}$, with a total leucocytosis of 21,000, must be interpreted as a significant warning of the intensity of the necessarily fatal septic absorption.

There is in most cases a postoperative or, more properly speaking, postanesthetic temporary leucocytosis. While the data at hand are insufficient to warrant any generalization, an impression was gained that the polynuclears behaved quite consistently in such cases, rising more or less proportionately with the leucocytosis and subsiding likewise.

In the convalescence after operation the relative differential count always proved itself of value, more particularly after abdominal section with wound infection, the differential count showing a rise of the polynuclears consistent with the temporary leucocytosis rather than a disproportionate increase which would have been suggestive of a progressive peritonitis.

It was of value in several cases of miscarriage or abortion in confirming the belief that we were dealing with the effects of the retention of the products of gestation rather than with septic infection.

It was of value several times, by the presence of a very low polynuclear (28 in one instance) in calling our attention or confirming our suspicions as to the probability of a typhoid fever.

As regards the value of a rise in the proportion of polynuclears as indicating the existence of a typhoid perforation, the writer has no direct data. Its value has been insisted on by some, and the disproportionate rise should naturally be expected with a progressive peritonitis, which surgically does not interest as much as our intervention must anticipate the peritonitis in order to expect success.

It is probable that there may be an antemortem rise in polynuclear cells in certain conditions which should not ordinarily produce such an increase.

A moribund cancer of stomach showed leucocytosis of 7800, polynuclears of 86, a difference of 13 units on the standard chart. Moribund double hydronephrosis from sarcoma of bladder temperature 100, leucocytosis 9900, polynuclears 90, a disproportionate rise of 15 units on the standard chart.

In the case of a stricture of the urethra with a chill and a rise of temperature to 105.6, quickly subsiding without sequelæ, there was an interesting prognostic negative count of polynuclears, only 63 per cent. to 16,000 leucocytosis.

Two prostates showed interesting counts. One was very large and tender and highly suggestive of the development of an abscess. There was only 63 per cent. polynuclears, with 10,000 leucocytosis; 24 hours later there was a marked remission of all symptoms, and entire cure followed.

In the other, a large abscess was evacuated; leucocytosis, 10,000; 24 hours later there was a marked remission of all symptoms, and entire cure followed.

There were several curious observations from the usual behavior of the polynuclears to be noted, and it is probable that there was in these cases some counteracting influence for which there is at present no proper explanation:

E. G., woman, 28, with foci of multiple miliary abscesses of the kidney, cured by resection of the upper and lower lobes of the left kidney. She ran an irregular and high pyemic temperature and yet there was not in four examinations a polynuclear percentage higher than 68, the leucocytosis ranging from 7400 to 9300. On the other hand, this patient may be explained as of prognostic value and denoting that the process was not of a severe nature. Another case, of a man extremely ill with acute pyemic symptoms, which seemed to point to suppuration of the liver, showed great variations in the proportions of the polynuclears, which at no time rose above $88\frac{1}{2}$, although he immediately succumbed to an exploration of the liver, which was not the site of an abscess, but showed a condition of general breaking down of the tissue.

A large number of corroborative examinations were made on persons with non-inflammatory and favorable surgical lesions, such as reducible hernia, prolapse of uterus, deformities, etc., to see if any data might be developed which would invalidate our surmises as to what constitutes normal or abnormal differential counts; but in no instance was any inconsistency noted.

This investigation has covered only the behavior of the polynuclear cells as it was thought inadvisable to consider other elements from lack of sufficient material.

Attention should be called to one property of the eosinophiles, which seems not to appear in many of the recent works on blood, namely: the increase in gonorrhœa, which was found not infrequently in these observations, in one case as high as 6 per cent. in a case of gonorrhœal rheumatism, with a latent urethral lesion.

CONCLUSIONS.

The differential blood-count and its relation to the total leucocytosis is today the most valuable diagnostic and prognostic aid in acute surgical diseases that is furnished by any of the methods of blood examination.

It is of value chiefly in indicating fairly consistently the existence of suppuration or gangrene, as evidenced by an increase of the polynuclear cells disproportionately high as compared to the total leucocytosis.

The greater the disproportion the surer are the findings, and in extreme disproportions the method has proved itself practically infallible.

As the relative disproportion between the leucocytosis and the percentage of polynuclear cells is of so much more value than the findings based on a leucocyte count alone, this latter method should be abandoned in favor of the newer and more reliable procedure.

The negative findings showing no relative increase or even an actual decrease of the proportion of the polynuclear cells while of less value, shows with rare exceptions the absence of the severer forms of inflammation.

In its practical applications, the method is of more frequent value in the interpretation of the severity of the lesions of appendicitis and their sequelæ.

In order to have some standard to measure disproportion of the polynuclear percentage, it is suggested that a trial be made of the chart which is tentatively recommended under the arbitrary designation of "standard."

FIBROLIPOMA OF JAW AND NECK.

BY LEWIS W. ROSE, M.D.,

OF ROCHESTER, N. Y.

HENRY C. D., age 66, was brought to my service in the Rochester City Hospital by the ambulance, September 15, 1905. He had fallen unconscious in the street, and received a scalp wound over the right frontal region. His fall was probably due to a slight cerebral hemorrhage, from which he recovered, as he did from one two years ago.

This man is well known in Rochester, and is a familiar character on the streets. He is especially conspicuous by reason of an enormous mass on the left side of his neck, which he has always kept covered with a black silk bag. The patient states that this large, lobulated and pedunculated tumor (Fig. 1) has been gradually and continuously growing for about forty-three years. He also states that it started below the angle of the lower jaw, and was not connected with the parotid gland.

It now measures, in its largest circumference, 25 inches; around the pedicle it is 17 inches, and in length, from base to apex, about 16 inches. The skin is slightly movable over the growth in most places. It has some areas more or less adherent, due in part, probably, to the inflammatory action caused by the punctures of a needle which was used some years ago in treating the tumor by electrolysis.

In color and texture the skin resembles that of his face; the beard extends out over the growth, and hair thinly grows over most of it. The superficial veins are very large and prominent. The skin becomes stretched, tense and shiny when the tumor is not supported. This appearance is caused not only by the great weight, but also by the momentary rapid increase in size, due to the engorgement of blood within the tumor.

On palpation a lobulated, pedunculated mass is felt. It is movable about the structures of the neck at the point of attachment. Some of the lobes are quite hard, others impart a sense of elasticity, and one area is soft and apparently fluctuates. Portions of the skin are much thickened. Manipulation at times causes pain.

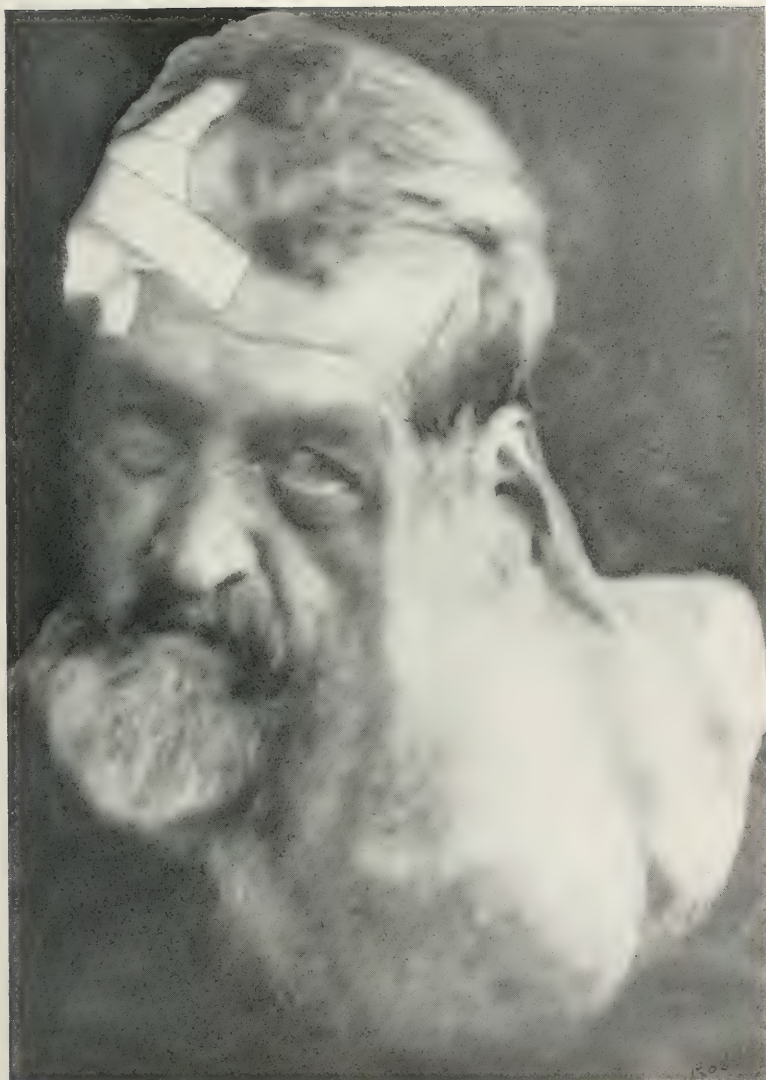


FIG. 1.—Enormous fibrolipoma of jaw and neck.



FIG. 2.—Large fibrous tumor growing from neck. Was successfully removed —Liston.
From Miller's Principles of Surgery (Edinburgh) 1852.



FIG. 3—Mixed Cartilaginous Tumor—Paget. Growing from the interstitial tissue
of the parotid gland (Warren. Fig. 123).



FIG. 4.—Enormous fibroma growing from left parotid region in a negress. Matas case. New Orleans Medical and Surgical Journal, February 4, 1894.



FIG. 5.—Lipoma of Parietal Region. Rotter's case mentioned by Chipault, in La Med. Moderne, December 11, 1895.

Some of the older writers, Muller, Rokitansky, Gluge and other German histologists, have given us the term "Mixed Lipoma," which term I think can be used to describe this growth.

Fibromata of the neck are described as being connected with the ligamentum nuchæ or vertebral periosteum; they vary in consistency, and may be either elastic or of stony hardness.

Some of the large tumors originating from the parotid gland are also described as fibroid; chondromata also have their origin from this gland.

In my case the tumor does vary in consistency, however, it did not originate from the structures mentioned. It was originally probably a simple lipoma.

That it is now a mixed lipoma may be inferred—First, from the presence of hard lobes, which hardness is due to an increase of the connective tissue stroma with fat obliteration—fibrolipoma. Second, from the presence of soft, jelly-like, and apparently fluctuating lobes—myxolipoma; this myxomatous degeneration is, according to Senn, the most frequent retrogressive metamorphosis in the stroma of these organs. Thirdly, from the apparent increase in size when this tumor hangs unsupported and the decrease in size when it is supported and slightly compressed, it is inferred that lipoma telangiectasis and also lipoma cavernosa exist.

There is no apparent calcification and it probably is not present. This form of degeneration, occasionally occurring in these tumors, arrests their growth. There never has been any arrest of development in this case. It has been a slow, continuous, and painless process.

The patient states that about forty years ago, when the tumor was small, a New York surgeon advised against its removal, as the result would probably be fatal. Since then he has not entertained the idea of surgical interference. Never until this time would he consent to be photographed, or have the case reported.

DISCUSSION OF THE PLEURA IN THE TREATMENT OF CHRONIC EMPYEMA.

BY JOSEPH RANSOHOFF, M.D., F.R.C.S.(ENG.),

OF CINCINNATI, OHIO.

THE prognosis and surgical treatment of purulent pleural effusions have undergone some radical changes by reason of comparatively recent bacteriological and, it might be said, operative experiments. In accordance with the bacteriological findings, the age of the patient, and the completeness of the drainage, these cases go to a speedy cure with absolute restitution to health, or run a course that is protracted in the extreme. In some cases, chiefly of tubercular origin or of grave streptococcus infection, incision practiced at the earliest practical moment and ample for drainage may yet fail to bring about that mobilization of the lung which is the one essential to a cure. On this last point I would insist chiefly for the mental relief of practitioners who, like myself, have seen acute cases assume an almost interminable course notwithstanding the early institution of drainage.

With the operation of multiple rib resections formally introduced by Estlander in 1877, to meet a condition of seemingly permanent retraction of the lung, our concept of the curability of chronic empyema was radically changed. The various modifications of thoracoplasty by Schede, Quenu, Jaboulay and others served only to make the mobilization of the chest-wall less hazardous, perhaps, and the contact of the variously fashioned flap from the chest-wall with the retracted lung easier. The Estlander operation and its modifications were based on the idea of the permanent disability of lung long bound down by adhesions to expand.

In 1893 there was elucidated a new fact regarding the functional value of lung-tissue long buried in thickened pleura

and fibrous adhesions. It was that the power to expand is not lost, and that if freed from its fetters the lung would again expand. Whom to credit with the discovery of this basic fact, which led to decortication of the lung in the modern operative treatment of empyema, it seems to me not difficult to determine. According to Terrier, Cornil made the observation in 1891. Before the French Surgical Congress of 1893 DeLorme reported on a case operated on by him in which he attempted the removal of the thickened visceral pleura. The patient suddenly died and the operation with pulmonary decortication was easily completed in the mortuary.

I may be permitted here to digress long enough to call attention to the frequency of sudden deaths during even the simpler empyema operations. I know of two such sudden deaths in this city. Probably the posture of the patient on the sound side during the operation has something to do with the frequency of sudden death during an operation that should *per se* be devoid of danger.

Without any knowledge of the observation of Terrier or DeLorme, Fowler, on October 7, 1893, operated on a case of empyema of two years' standing having a small rigid cavity, with a distinct intention to remove the scar-tissue from the diaphragm, pericardium and lung, with a view to permit the free expansion of the lung. Fowler having first performed the operation on the living, it is but right that priority should be given him by our continental friends. Whether it will be, is a question.

Decortication of the lung is but a step, although a very important one, in the operation for empyema. It cannot be considered an independent procedure. The cavities to be obliterated are usually so deeply placed and the pulmonary pleura so far from the surface that the formation of a large flap containing the soft parts and the ribs or multiple rib resection is necessary as a preliminary step to decortication. All attempts, therefore, to compare the results obtained from the

older methods of thoracoplasty with those from decortication are futile. As performed by Fowler and DeLorme, the operation consists, after sufficient exposure of the pleura has been achieved, of an incision through the thickened pleura down to the lung-tissue, from which incision the thickened pleura is dissected off, care being taken not to wound the lung. Because of the very close adhesions and the depth at which the work has to be done, this dissection *en masse* of the thickened pleura is sometimes tedious in the extreme. DeLorme's first case required one and a-half hours to complete the operation, although the cavity was less than three inches in depth and width and four inches in height.

A perusal of the relevant case reports collected within the last five years by DeLorme, Fowler, Vosswinkel and Jordan makes it evident that in many cases insurmountable difficulties are in the way of anything like an extensive decortication. One of my first cases was of this nature and from it I learned, what other operators must certainly have observed, namely, that an incision carried through the thickened pleura until the lung-tissue is reached, as is evidenced by the bluish tint in the floor of the cut, widens out rapidly and in full view, more with each respiration until the cut becomes a groove. Whether this widening of the cut is due to the expansion of the lung or to the traction of the elastic chest-wall, or to the inherent tendency of divided scar tissue under tension to retract, I am unable to say. My belief is that the last-named cause is the most potent factor, for I have made the observation that many times the gap made by the incision grows narrower for the time being during inspiration to get wider again during expiration. This may be due to the negative pressure within the lung at the time of inspiration, by reason of the greater inrush of air through the opening in the chest-wall than can enter the lung by way of the bronchus.

Where one incision carried to the lung-tissue widens into a groove, so will a second and a third, and any number that

may and can be made. Upon these principles I acted on my first case and in the rest to be reported, and devised what perhaps might be called discission of the pulmonary pleura as a modification of the operation of decortication, which I believe it may in time supplant. The special feature of the procedure consists of gridironing the pulmonary pleura with many parallel incisions removed from each other about a quarter of an inch, and of crossing these obliquely or at right angles with other parallel cuts. Little islands of thickened pleura are thus left on the surface of the expanding lung. But if the cuts have been made deep enough they shrivel in size while the discission is still in process of being completed.

A further feature towards liberating the lung is an incision cautiously carried through the length of the groove or angle of reflexion of the costal and pulmonary pleura. In large cavities the line of reflexion is, of course, not always easily found. If the incision be limited to the costal part of the gutter and carried towards the chest-wall, there is no danger of wounding large vessels or of opening the sound pleura above. The hemorrhage which attends discission is really slight and easily controlled.

CASE I.—E. M., male, aged 18, of Mitchell, Ind. First examination, June 6, 1901. Patient states that ten weeks ago he was seized with pleuro-pneumonia of the left side that was followed by a purulent effusion. An incision was made on the fourteenth day and a large quantity of pus evacuated. The drainage-tube was removed after two weeks, but because of a reaccumulation was replaced five weeks ago. The discharge is slight, but requires two dressings daily. Temperature and pulse have been normal for two weeks. Present condition: A well developed young man with a fistulous operation in left seventh intercostal space to the outer side of the scapular angle. The drainage-tube, six inches long, leads into a cavity which holds a little over three ounces.

Physical examination shows normal resonance and vesicular breathing as low as the fourth rib in the line of the fistula. Below

this level, dullness and very faint respiratory sounds. Patient being on his way north for the summer, was advised to return for operation in the fall.

Operation Jewish Hospital, November 7, 1901. Condition of patient unchanged. Long incision in line of fistula with the cut surrounding, but not passing through it. Subperiosteal resection of five inches of the sixth and seventh ribs. Through the incision of the soft parts a cavity lined by a dense membrane was opened. Its floor was readily inspected and found just within reach of the finger-tip. An incision was made through the membrane down to the lung with a view to decortication. Owing to the depth of the surface and the density of the membrane this was impracticable. Noticing that the incision widened under observation a second one was made, then a third and a fourth. These were crossed by other incisions and one was gradually made along the groove of reflection of the thickened pleura from the lung to the parietal wall. The lung expanded visibly from the moment the first cut was made through the thickened pleura. As much as possible of the thickened costal pleura was excised. Light packing with iodoform gauze. The patient's temperature rose rather sharply for four days after the operation and resumed the normal by the end of the tenth day. He left the hospital December 4 with the wound nearly closed. By the first of January the wound had closed entirely without leaving any deformity, and the breathing-sounds at the site of operation were normal. There has been no recurrence.

CASE II.—Frank T., aged 20, dental student; admitted to Cincinnati Hospital, April 22, 1900, for a stab wound of the abdomen. In the eighth intercostal space in the line of the anterior axillary fold there is a punctured wound apparently made with the blade of a pocket-knife. The patient is very much shocked and vomits blood. Immediate laparotomy by an incision along the left costal border reveals much blood in the abdomen coming from a clean wound in the anterior wall of the stomach. The wound, which was about an inch in length, was closed by a double row of sutures. The posterior wall of the stomach was not injured. Immediately after the operation the patient was removed to a private room in the hospital. Two weeks after the injury, when the patient seemed about recovered, there

developed a left-sided pleurisy with great dyspnoea, displacement of the heart to the right side of the sternum, and grave general symptoms of sepsis. On the fifth day after the inception of this complication, drainage was established by the resection of an inch or more of the sixth rib. Fully a quart of pus with many shreds of lymph and clotted blood was discharged. The lung was found greatly retracted, and expanded but little from the relief of tension. Cultures showed the infection to be of the streptococcus type.

While the operation was followed by some improvement in breathing and the return of the heart to its normal place, the pneumothorax did not seem to decrease. The fever continued high during fully two weeks, when a counter opening was made with a resection of an inch or more of the seventh rib behind the posterior axillary line. This more efficient drainage caused some improvement, but it failed after four weeks' faithful trial, with frequent irrigations, to either do away with the high temperature or reduce the size of the cavity. The only breath-sounds faintly audible on the left side were heard behind on a level with the scapular spine. Therefore, multiple rib resection with removal of the thickened costal pleura was determined.

Operation, June 20, 1900. Resection through three long incisions of the fifth, sixth, seventh, eighth, and ninth ribs. The pieces of the ribs resected decreased in length from below upwards. From the inner surfaces of the musculocutaneous bridges left by the incisions the thickened pleura was scraped away. The pulmonary pleura was freely incised by gridironing incisions, and a marked expansion of the lung was immediately noticeable. The upper portion of the empyemic cavity could not be reached, but because of the weakened condition of the patient further operation was refrained from. The patient bore the operation well and improved rapidly. Three weeks later a fifth operation was performed on him. Portions of the second, third and fourth ribs were resected, and the costal pulmonary pleura treated as before. After six months' stay in the hospital he returned September 22 to his home in Hillsdale, Mich., where under the care of Dr. Sawyer complete recovery ensued. I saw the patient two years after the operation. He was in perfect health. There was relatively little sinking in of the chest-wall,

although the defect in the bony thorax is nearly ten inches in height and one and one-half to five inches in width. There is no apparent regeneration of the ribs.

CASE III.—Mrs. G. B. S., widow, aged 30. Entered Good Samaritan Hospital May 22, 1903. Family history negative. Husband died of tuberculosis in Colorado three years ago. About one year after his death the patient was seized with severe pains in the right side of the chest and right shoulder, and began to cough. This condition continued for two months, with evening exacerbations of temperature. Ten weeks after the beginning of her illness thirty-five ounces of pus were removed by aspiration. Three days later the temperature rose to 104 in the evening, and continued so for four weeks, when an incision for drainage was made. The wound has discharged for over twenty months.

Present condition: The patient is confined to her bed most of the time and is very anæmic. Pulse always rapid and small. Evening temperature ranging between 100 and 101. There is some cough but no expectoration. The right side of the chest is very much retracted and immobile. The lower intercostal spaces are very narrowed. In the sixth space in the axillary line there is a small fistula with rigid and indurated margins. The probe passes upwards and inwards for a distance of eight inches. There is a cavity here which holds about thirty ounces; any attempt to force more into it causes violent coughing. Vesicular breathing suspended over the front and side of the chest below the fourth rib. It is very faintly heard above. Sputum examination negative. Diagnosis: Chronic empyema.

Operation May 25, 1903. Subperiosteal resection through three incisions of the fifth, sixth, seventh, and eighth ribs. The overlapping of the ribs made the resection somewhat difficult, although this part of the operation was very much facilitated by Doyen's ring-shaped costal periostotome. The diaphragm covered by a dense membrane projected far into the chest cavity, and the greatly retracted lung was freely exposed in the depth of the large wound. The thickened parietal pleura was easily dissected away. The adventitious membrane over the diaphragm was easily incised and the incision widened somewhat. Free dissection of the pulmonary pleura, as in the previous cases. The wound was loosely packed with tampons of iodoform gauze, the ends

of which were made to project through the incisions in the soft parts. The patient promptly recovered from the operation, and was enabled to return to her home, with a fistula leading into the upper portion of the empyema cavity.

Second operation, October 13, 1903. The patient now presents the appearance of perfect health. There is a fistula some five inches in depth in the line of the upper incision, made at the previous operation. Resection of the second, third and fourth ribs, with treatment of the pleura, as in the previous operations. The patient left the hospital after three weeks with the wounds practically closed. She presented herself for examination eighteen months after the second operation. She is in perfect health. There is very little deformity of the chest-wall nor is there any deflection of the spinal column. The respiratory expansions are almost as great as on the sound side.

CASE IV.—Nicholas M., aged 34. Admitted to Cincinnati Hospital October 15, 1904. Family history negative. Was brought into the hospital with a penetrating wound of the chest. One inch to the right of the twelfth dorsal spine there is an incised wound about one inch in length, apparently non-penetrating. Two inches to the right and between the tenth and eleventh ribs there is a second incised wound about an inch in length, which is penetrating. Urine analysis negative. Wounds are dressed aseptically after the custom of the hospital October 16, temperature somewhat elevated. Pulse 100 and a fair tension; respiration increased to 36 per minute. There is pain on the right side of the chest on breathing.

Physical examination shows dry pleuritic rub in the axilla and around posterior wound. Was ordered $\frac{1}{40}$ grain of strychnia every three hours, and purgation by calomel and enema. Ice-bags were ordered to abdomen and chest. October 17 flatness over whole right side of the chest, with absence of breath-sounds posteriorly and in axilla. Breath-sounds exaggerated anteriorly. Pain over the right side of chest on breathing. Respiration shallow and labored. Temperature 101. When the dressing was changed a quantity of dark and infected blood escaped from the upper wound with each respiration and especially on coughing. There escaped altogether thirty-four ounces from the pleural cavity.

Under ether anæsthesia drainage was established. The patient's condition, while it improved somewhat, was not materially changed as to the intrathoracic condition. There had been developed an empyema with retraction of the lung. Temperature ranged in the course of two weeks between 99 and 104.

Operation December 4, 1904, under ether anæsthesia. Schede resection of right chest-wall with resection of five ribs and the removal of the thickened parietal pleura. Discission of the pulmonary pleura with distinct widening of the incisions visible during expirations. Wound packed with gauze. From this day on the highest temperature fell to 102. In order to complete the obliteration of the empyemic cavity a second resection was made on December 29, when three ribs were resected. With the expansion of the lung now following the discission, the cavity was completely obliterated. From this time on the patient recovered his strength. His weight rose from 97 pounds to 110 pounds. He was discharged on April 27, since which time the wound has closed permanently. He is again at his usual work of driving a beer-wagon, doing all the hard labor that may be required in the discharge of his work.

It would have been easy to increase the number of cases of empyema that have come under my observation, but I have refrained from referring to those which come in very young subjects and those of later life which are secondary to tuberculosis with or without pulmonary fistula. The prognosis in the first class is usually so good when early drainage is instituted, and in the second class often bad notwithstanding any method of treatment, that I believed it wise to mention only cases of traumatic origin and those clearly the sequel of a metapneumonic process. In looking over cases of this character in adults, it became evident at once that aspiration and even incision without rib resection is of little service. In all of these cases multiple resection should be made at an early period and before the strength of the individual has been reduced by prolonged sepsis. In the operation for chronic empyema with fistula, certain rules can be formulated, which, if followed with-

out making every operation absolutely schematic, will be reasonably certain after one or two procedures to cause complete obliteration of the cavity with very liberal expansion of the retracted lung.

First. Every operation on the thorax for pleuritic effusions of any kind should be done with the patient upon his back or slightly resting on the sound side.

Second. An incision should be made above the fistulous opening and a piece of one of two ribs removed in order that the cavity may be subjected to inspection and to touch.

Third. According to the size of the cavity thus determined, multiple subperiosteal rib resections are to be made either through a number of parallel incisions, through the U-shaped Schede incision, or through a trap-door incision, a method favored by the French surgeons. It matters little which of these methods be practiced, provided that the resections be ample and that the thickened parietal pleura be excised.

Fourth. Attention should then be given to the diaphragm and the pulmonary pleura. Incisions here should be made after the manner described. If the thickened pleura can be removed by decortication easily, it is perhaps preferable. If ample expansion of the lung does not ensue, an incision in the groove of reflexion of the costal and pulmonary pleura must be made.

Fifth. The condition of the patient should be carefully watched, lest too much be done at one sitting. When the cavities are large, repeated operations are necessary for the safety of the patient. In one case, which I saw with Prof. Evans, no less than eight operations were necessary to effect a complete cure.

THE MOVEMENTS OF THE STOMACH AND INTESTINES IN SOME SURGICAL CONDITIONS.*

BY WALTER B. CANNON AND FRED T. MURPHY,

OF BOSTON, MASS.

(From the Laboratory of Physiology and the Division of Surgery in the Harvard Medical School.)

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THERE has been within recent years much physiological investigation of the motor activities of the alimentary canal. The results of this investigation are in some instances of value for their bearings on surgical problems, but usually the relation between the physiological and the surgical conditions is too indefinite to permit exact conclusions to be drawn. On the other hand, a review of the literature of surgical experimentation on the alimentary canal shows that the interest has been largely restricted to such questions as the healing of intestinal sutures and the bounds of possible removal of portions of the large and small intestine without causing death. Relatively little attention has been paid to the behavior of the gastro-intestinal tract after abdominal operations or in conditions demanding surgical interference.

* The results of this investigation were presented before the Boston Society of Medical Sciences, November 21, 1905.

The research here presented is an attempt actually to see how the stomach and intestines move, and how the food is treated by the motor activities of these organs, under various surgical conditions in comparison with normal states. Only certain surgical situations were selected for study. These were: The immediate consequences of operation; the results from different varieties of intestinal suture; the effects of stenosis and obstruction, and of embolus and thrombosis, and the question of postoperative paralysis. The movements of the food in the digestive tract in each of these conditions will be considered in turn in the following pages.

The method employed in this investigation was that used by Cannon and Blake,¹ in an experimental study of gastro-enterostomy and pyloroplasty.

In brief the principles of surgical cleanliness and technique were observed in the operations, and in the preparation and after-care of the animals. To watch the movements of the stomach and intestines, subnitrate of bismuth in small amount was added to the food, and the changes of the shadows of the food, cast upon a fluorescent screen by the Röntgen rays, indicated the activities of the walls of the alimentary canal. Thus the animal was observed, without etherization or drugging, in a quite natural state except for the operation. Any marked deviation from the normal functioning could therefore be regarded as due to operative interference. Because cats are easily observed with the Röntgen rays, and because standards of activity under normal conditions have been established for these animals,² they were used in the present investigation. For twenty-four hours previous to operation or observation the animals were given no food.

MOVEMENTS OF THE STOMACH IMMEDIATELY AFTER INTESTINAL OPERATION.

In order to test the immediate effect of intestinal operation on a definite activity of the alimentary canal, the rate of discharge of food from the stomach was chosen. When cats

are given by stomach tube 25 c.c. mashed potato mixed with 5 gms. bismuth subnitrate, gastric peristalsis begins soon after the food is introduced; and usually within ten minutes the pylorus has relaxed and permitted some of the gastric contents to enter the intestine. As pointed out in a previous investigation³ the *aggregate length* of the shadows of the intestinal contents at different times after feeding, may be taken, in the early stages of intestinal digestion, as evidence of the rate of discharge from the stomach. Potato, for example, ordinarily leaves the stomach rapidly; at the end of a half hour the average aggregate length of the shadows of food-masses in the small intestine is about 10 cm.; at the end of an hour, about 30 cm., and at the end of two hours the amount of food in the small intestine attains its maximum, with the length of the shadows aggregating 43 cm. The question to be settled was the effect of intestinal operation on this rate of discharge from the stomach.

The intestinal operation performed to aid in answering this question was either simple section of the gut or resection of about eight inches, followed by end-to-end union by means of the F. G. Connell suture. The operation in the first cases was done about 18 cm. below the pylorus. The etherization lasted uniformly one half-hour, so that the anæsthesia-factor was fairly constant. Usually within twenty minutes after the etherization is stopped the animals so far recover as to be able to sit up and move about. A half-hour after the stopping of the anæsthesia the animals were given by stomach-tube 25 c.c. mashed potato with 5 gms. bismuth subnitrate. The times of observation—one half-hour, one hour, and every hour thereafter for the first seven hours after the feeding—corresponded to the times of observation adhered to in establishing the standard of activity in normal conditions. A permanent record of the distribution of the food in the alimentary canal was kept by tracing on transparent paper laid over the fluorescent screen, the outlines of the shadows cast by the food. The aggre-

gate length of the shadows of the intestinal contents at the regular times of observation, under normal conditions, and in a typical case after intestinal section about 18 cm. from the pylorus, is presented in the following figures :

Time in hours	$\frac{1}{2}$	1	2	3	4	5	6	7
Normal	9.0	31.0	43.0	25.0	21.0	13.5	9.0	4.0
After section	0.0	0.0	0.0	0.0	0.0	0.0	7.0	8.0

In Figure 1 is shown graphically a comparison of the amount of food in the small intestine at regular intervals after feeding potato, both under normal conditions and immediately following intestinal section and suture. Under normal conditions this food begins to leave the stomach soon after its ingestion, usually within ten minutes, and the dis-

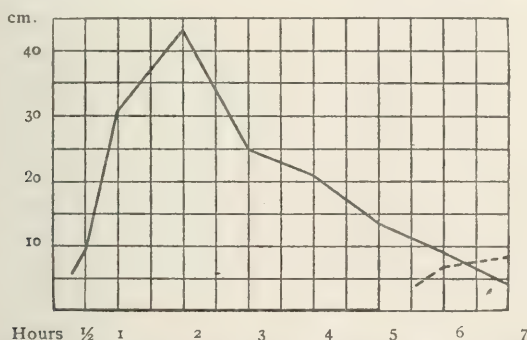


FIG. 1.—Curves showing the aggregate length in centimetres of the masses of potato present in the small intestine at regular intervals for seven hours after feeding. The continuous line represents the normal condition; the dash-line the typical condition immediately following intestinal operation near the pylorus. The delay is due to continuous closure of the pylorus, for gastric peristalsis was seen at every observation after the first half hour.

charge continues so rapid and abundant that the stomach is emptied in about three hours. After high intestinal operation, on the other hand, this food began to emerge from the stomach only after five or six hours. The delay, as will be shown later, was not due to etherization or to section of the abdominal wall.

This striking difference between the normal and post-operative discharge of carbohydrate food from the stomach is

due to an altered functioning of the pyloric sphincter. The gastric peristaltic waves under normal conditions are seen running continuously, so long as food remains in the stomach.⁴ In these postoperative cases, likewise, at every observation after the first half-hour of digestion, peristaltic waves were seen coursing regularly over the stomach to the pylorus. And under normal conditions, as already stated, the pylorus relaxes usually within ten minutes after the ingestion of such food as potato, whereupon the peristaltic waves begin the discharge into the intestine. But in these postoperative cases, in spite of peristaltic rings pushing the food up to the pylorus about five times a minute for more than five hours, the sphincter held perfectly tight against this repeated recurrence of pressure and did not permit the food to pass on into the injured gut.

The remarkable character of this protective mechanism of the pylorus appears in comparing the time required for primary cementing of intestinal wounds with the time during which the food is retained in the gastric reservoir. "Under favorable circumstances a firm lymph or gluey exudate, which is a natural means of repair, is promptly thrown out and spread around and upon any wound of the peritoneum, either visceral or parietal. It often begins to appear firm and available to hold surfaces together within two hours. The usual time, however, when it may be expected to afford efficient support is after at least six hours have elapsed."⁵ It is certainly very striking that the period of primary repair and the period during which the food is prevented from entering the injured intestine should so closely coincide.

From evidence which is to be presented later, as to the paralyzing effect of handling, it seems probable that the immediate region of intestinal suture is protected from any demand for normal functioning by the manipulation incident to the operation. Some evidence on this point was secured by making an intestinal section and suture (end-to-end) about 3 cm. above the ileocæcal valve. The animal was fed as pre-

vously described. Food was first seen to have left the stomach at the end of two hours; and during the remainder of the seven hours of observation it continued to accumulate in the small intestine. In normal conditions mashed potato reaches the colon in two or three hours after it is fed; but in this case at the end of seven hours nothing had yet appeared in the large intestine. There was no evidence of obstruction, such as bulging of the gut and powerful and repeated peristalsis in the region of stasis. The intestinal masses merely accumulated and remained unmoved. It may be that at any point along the alimentary canal injury produces a functional blocking effect which saves the injured part from activity until a certain degree of repair has taken place.

In all cases observed there was no question of the patency of the lumen of the gut. The day after the operation and the feeding the total remnant of the food was invariably found in the large intestine, and the animal was in the best of spirits.

The mechanism causing the pylorus to remain closed for so many hours while gastric peristalsis continues active is left undetermined. Whether the injured intestine is the origin of a reflex effect on the pylorus, which is mediated through the central nervous system or through the local nervous mechanisms of the intestinal wall, is a matter for further investigation.

THE EFFECTS OF END-TO-END AND LATERAL INTESTINAL JUNCTION.

In resecting the intestine to remove stricture, in getting rid of gangrene, lacerations and large perforations, intestinal union must be employed. Clinical experience has not yet determined whether end-to-end or lateral methods of uniting the divided intestine are preferable. In favor of the lateral junction the argument has been urged⁶ that it permits conveniently a desirable large contact of serous surfaces—a condition said not to be possible in the end-to-end union without dangerously narrowing the lumen of the canal and without liability

of producing ischæmic necrosis from pressure on mesenteric vessels involved in the suture. It has also been claimed for the lateral anastomosis that it can be used without regard to the size of the intestinal parts to be united, and that with it the opening between the two intestinal ends can be made as extensive as may be wished. On the other hand the tendency of all lateral unions of the parts of the alimentary canal to undergo cicatricial stenosis has been repeatedly recognized. And studies on animals have shown that indigestible substances, such as straw and hair, may accumulate at the point of lateral union and block the passage.⁷ It is stated, however, that such a condition has never been cited as true of man whose diet must be and is carefully watched after operation.

From theoretical considerations there are possibilities of functional disturbance both in the end-to-end and in the lateral union. There exists in the intestinal wall a reflex mechanism such that a stimulus at any point causes contraction above and relaxation below that point.⁸ It is thus that masses of food are pushed through the alimentary canal. In the end-to-end junction two severed ends of the intestine are sewed together. It is conceivable that the transverse cutting of the gut destroys locally the nervous mechanism governing peristalsis, and that under these conditions there is a stasis of the food in the region of the union. In lateral anastomosis the circular muscle-fibres of the canal are cut—the fibres which force the food onward. Contraction of the circular muscle singly in either one or the other of the overlapping intestinal ends could not force the food onward, but must simply shift the food over into the inactive part. In order that there shall be propulsion of the contents of this region there must be a coördinated, advancing contraction of the circular fibres simultaneously in the two apposed loops. As already noted undigested material has been found as a remnant in the region of lateral junction. Is there in this region a stasis of the normal food material?

In order to try these possibilities of functional disturbance, intestinal sections and resections were made in animals and the severed gut then united either end-to-end or laterally. The operation was performed as near as possible beyond the delicate fold of mesentery which holds the end of the duodenum in place. There are two advantages in having the operation at this point: The point is fixed so that the position of the suture can be recognized fairly accurately in observations with the X-rays; and also, the point is so near the stomach that the observer does not have to wait long after feeding the animal before the food reaches the region he wishes to study.

Observations were made on different animals one, four, seven, and ten days after end-to-end union of the intestine. In no case was the slightest evidence of stasis of the food in the region of operation to be observed. The food was passed along that part of the intestine as it was passed along other parts.

The results were quite different with lateral anastomosis. Animals permitted to live ten days or two weeks showed usually the condition already mentioned as observed by Senn and Reichel—a more or less complete blocking of the canal by accumulated hair and undigested detritus at the opening between the apposed loops. In order to see whether there was a stoppage of the normal food at the anastomosis, animals were operated upon and carefully fed for four days on food with little waste. Then they were given a rather thin boiled starch (4 gms. starch : 100 water) with an admixture of subnitrate of bismuth. As long as this food was passing through the intestine some of it was always present at the junction. And when almost all the unabsorbed material was in the colon there still remained a large mass filling the widened lumen where the coils were laterally joined. Observation the next day showed the mass still at the anastomosis. Autopsies on these animals proved that the stasis of the food was not due to previous accumulation of indigestible waste. The region

of junction was filled, not with hard material but with a pasty stuff, in physical characteristics much like that seen ordinarily in the small intestine, and certainly capable of easy transmission through the gut by peristalsis. It is evident that in these cases the two apposed coils did not act together to propel the enclosed food. The food was forced through the region of the union by a push from behind, a push exerted by the peristalsis of the intact wall driving new particles of food from time to time into the accumulation at the junction. And when no food remained to act as an intermedium between the accumulated mass in the widened lumen and the pressing peristalsis of the intact gut there was nothing to continue the propulsion of the food through the chamber formed by the united loops, and the mass was left unmoved.

Inasmuch as stasis of the food was not observed at any time after end-to-end union of the severed gut, while after lateral anastomosis the ordinary food was stagnant in the region of junction, it is clear that, other things being equal, the end-to-end union is to be preferred to the lateral for rapid resumption of the normal functioning of the canal. It is known that in some cases at least after lateral union the canal may become changed from a crooked to an almost straight tube.⁹ Possibly as such an alteration takes place there may be a restitution of the functional efficiency of the joined parts. It must be admitted, however, that the absence of this functional efficiency, for some days certainly and probably for weeks after the operation, renders lateral anastomosis not an ideal procedure. And on the other hand, the dangers of the end-to-end union have been largely obviated by recent improvements in the technique of intestinal surgery. The use of the F. G. Connell suture has permitted us to join the ends of the cat's severed intestine, an intestine with a thick wall and a relatively small lumen, a large number of times with never a sign of obstructive narrowing of the lumen, and with so little of the intestinal wall turned in as to make compression of mesenteric vessels and ischæmic necrosis highly improbable

contingencies, yet such firmness of union that there was never doubt that the junction would be strong and tight. As to the claim made for lateral anastomosis that it permits the opening between the two intestinal ends to be as large as one may wish, it may be stated that this can be done only by more extensive cutting of the circular muscle of the intestine, thereby still further interfering with peristaltic activity; and also, that the condition to be desired is not so much a large opening as an opening that functions satisfactorily.

Although our experiments have led us to differ from the opinions of Ashton and Baldy¹⁰ as to the universal desirability of lateral approximation, we agree with them as to the danger of allowing the blind ends of the intestinal loops in lateral union to extend beyond the anastomotic opening. If they each extend beyond the opening, the proximal closed loop, in our experience, is in danger of becoming packed with hardened waste; and the end of the distal loop is likely to invaginate until the invaginated portion fills the lumen in the region of the anastomosis and produces obstruction.

THE EFFECTS OF INTESTINAL OBSTRUCTION.

The manner in which food was treated when the lateral anastomotic opening became completely closed by accumulated detritus, led to further observation on intestinal obstruction. For this purpose stenosis was produced by tying a coarse linen ligature tightly around the gut near the duodenal band. When animals were treated in this manner we found it necessary to make observations upon them within a day or two after the operation; if the interval was longer, the ligature sank so deeply into the intestinal wall as to be entirely covered by peritoneum. Under these circumstances the narrowing effect of the ligature naturally became less and less with the lapse of time.¹¹ Animals in which a part of the intestine had been reversed, and cases of operative kink, served also for observation on the effects of intestinal obstruction.

The presence of obstruction in the intestine even within

25 cm. of the pylorus did not retard the discharge of food from the stomach. As the food collected in the obstructed gut there was seen in every instance a remarkable exhibition of intestinal activity. Ordinarily in the small intestine a repeated segmentation of the food into small masses is a much more common activity than peristalsis. Peristalsis is only an occasional occurrence.¹² But in these cases of obstruction the food was over and over again pushed toward the obstruction by repeated waves of peristalsis. And the moving constrictions were evidently powerful, for as they advanced, the walls of the canal in front were bulged widely by the compressed contents; and when the peristaltic ring could no longer withstand the pressure it was causing as it moved, the

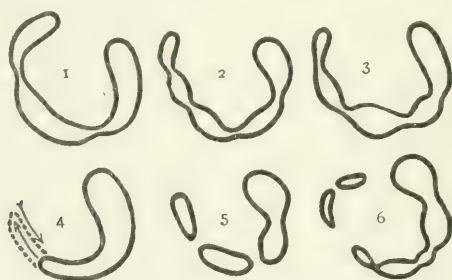


FIG. 2.—Tracings of the shadows of the contents of an obstructed loop of intestine, showing the sequence of changes through segmentation and peristalsis during a few moments of observation about an hour and a half after feeding. In the condition represented by No. 4, there was repeated peristalsis with regurgitation of the food through each advancing peristaltic ring.

contents squirted back through the moving ring for some distance along the gut. No sooner had one wave passed over the accumulated food to the point of blocking than another would start and go over the same course again, or a series of rhythmic contractions would occur, dividing the contents into large segments and sometimes separating them widely from one another. The numbered parts in Fig. 2 are tracings of the sequence of changes in the shadows of the food during a few moments of observation about an hour and a half after feeding boiled gluten-flour. Similar activities, though not so

violent, were seen taking place an hour previous. Other cases, observed during a longer period, showed this same vigorous squeezing and churning of the accumulated food, alternating, however, with periods of rest.

It is clear from the observations above recorded that in the presence of intestinal obstruction there is aroused an activity of the circular musculature which must tend to compensate for the obstruction, and work to obviate it. These results support a contention made in an earlier investigation¹³ that under normal conditions kinks and sharp bends in the intestine must have food forced through them by peristalsis. A kink was artificially produced by turning a loop back on itself for about 4 cm. and sewing together the surfaces in contact. Observation five days later proved that the food was pushed around the very sharp bend of the tube by the vigor of the peristaltic waves.

In order to test whether functional intestinal obstruction could be caused by opposing the directions of peristalsis, various lengths of the small intestine were in several animals resected and sutured end-to-end but with the direction reversed. Our results in the main confirm those of Mall and others¹⁴ who have experimented on intestinal reversal. Although food was driven through when the reversed portion was relatively short—about 20 cm. in length,—there was in all cases an enlargement of the tube and a stasis of undigested waste in the region of the upper suture. These observations are generally interpreted as proof that antiperistalsis of the small intestine, a reversal of the direction of its motor function, does not occur. Opposed to this conclusion is the clinical evidence that in cases of intestinal obstruction there may be continued vomiting of offensive decomposed material after the stomach has been repeatedly washed—the so-called “fecal vomiting.”

In relation to this conflict of evidence, observation made on an animal with a reversal of about 20 cm. of the intestine just beyond the duodenal band is of interest. The observation was

made six days after the operation. At the autopsy soon after the observation a heap of indigestible stuff was found obstructing the canal at the upper suture. With the X-rays the food had been seen again and again to leave the stomach; as it collected in the duodenum it moved onward, with occasional segmentation, through a definite course which was traced on transparent paper; finally it began to accumulate in the region of the upper suture. About a half hour after the feeding the whole mass began to be tossed about by the alternating periods of segmentation and peristalsis already described as characteristic of the state of obstruction. Suddenly the mass was seen to be divided near the enlargement of the upper suture; then the proximal part of the mass was moved rapidly back along the course which had been traced, even up to the pylorus. This reversed movement of the food has been seen repeatedly with perfect distinctness. The method used does not permit seeing the contractions of the intestinal wall; only the effects of such movements on the food can be observed. But if food had been moved forward as in this instance it was certainly moved backward, the movement must assuredly have been attributed to peristalsis. It seems to us probable that a direct study of peristalsis in animals in which obstruction and stasis of food have been caused may prove that in such conditions reversal of the normal direction of peristalsis readily occurs.

THE EFFECTS OF THROMBOSIS AND EMBOLISM.

In testing the effects of thrombosis and embolism, either the veins or the arteries supplying more or less extensive areas (varying from 10 cm. to most of the small intestine) were tied, and the connecting arches in the mesenteries were also tied to prevent collateral circulation. Care was always taken to avoid including nerves in the ligatures. In both conditions there was a sudden stoppage of a continuous supply of nutriment and oxygen to the parts involved. It was perhaps to be expected, therefore, that there would be, as in human beings, a similarity of effects in the two conditions.¹⁵

The operation was performed in every case during a uniform period of etherization—one half-hour; and about an hour and a half after the operation the animals were fed 25 c.c. mashed potato mixed with 5 gms. bismuth subnitrate. Three animals were taken for each condition. In only one of the six there was any activity of the stomach and intestines. In that one (a case of embolism) food passed out from the stomach for a time; then the pylorus closed and, although gastric peristalsis continued for about four hours, there was no further accumulation of food in the intestine. At the autopsy the gut just above the affected part was found somewhat dilated with food, but the gut below was wholly clean and free from contents. In the other five animals there was no gastric peristalsis and no discharge of food into the intestine.

The absence of gastric peristalsis in these cases of embolism and thrombosis of the intestine notably distinguishes them from the cases of high intestinal operation. Usually within an hour the animal vomited, and if the gastric contents were not at that time mostly ejected the animal ordinarily vomited again. And within three or four hours the animals usually began to exhibit a condition of lethargy and tonelessness, which increased as time passed. The extent of the intestine involved in the disturbance of circulation seemed to make little difference in the effects.

Autopsy of the animals with veins tied revealed the typical anatomical changes described by investigators who have studied experimentally hæmorrhagic infarcts of the intestine.¹⁶ In the involved portion of the gut, the wall was thick and tense with infiltration, the lumen contained a thick bloody mass resembling clot, and a free sanguinous fluid was present in the peritoneal cavity. The involved portion of the intestine in the cases of artificial embolism was not so greatly altered as in the thrombosis cases, but it was red and injected, was moderately distended, and contained a foul grumous stuff slightly reddened.

The inactivity of the bowel, after food had entered it, in

the case of artificial embolus above reported, illustrates one of the three types of dynamic ileus in Nothnagel's classification¹⁷—the type attended by anatomic lesions, such as embolism and acute general peritonitis. Of the other two types—toxic entero-paralysis, and functional nervous paralysis of the gut—the latter is of special surgical interest, since probably to that type belongs the intestinal paresis occasionally following laparotomy.

THE QUESTION OF POST OPERATIVE PARALYSIS OF THE INTESTINE.

According to Kocher¹⁸ the non-inflammatory dynamic ileus after abdominal operations depends upon a slight adhesion of the intestinal coils due to injury to the serosa, either circumscribed or extensive, and he thinks it probable that the circulatory disturbances following laparotomy exert an important influence on the contractility of the intestine. Scant credit is given to the idea that dynamic ileus is a purely functional disturbance—"little mechanical obstacles lie at the bottom of it." Nothnagel¹⁹ on the other hand, reported a case of pure *ileus paralyticus*, with tympanites and other symptoms of obstruction, but showing at autopsy no cause of intestinal inactivity. Similar cases are seen after contusion of the testicle, after abdominal injury with a blunt instrument, after the relief of strangulated hernia, and during severe attacks of renal or biliary colic.

It is evident that postoperative paralysis of the alimentary canal must arise from the general condition of the patient, from alterations produced by the operation, or from a combination of the two. If the general condition of the patient is good, the trouble following operation may be due to the nature of the surgical interference or to the factors attending the surgical procedure. The character of the disorder to be attacked may leave little choice as to the nature of the surgical operation, but the manner of operating is to an important degree under control. And if the duration of the etherization, or the ex-

posure of the stomach and intestines to the air, or the cooling or the handling of them, tends to produce functional disorder, it should be known. With the object of learning the action of these factors attending abdominal operation, they have been studied in their effects on the discharge of food from the stomach and its passage through the small intestine.

1. *The Effect of Etherization.*—In order to test the effect of etherization animals were etherized one half hour or one hour and a half; and about a half-hour after the etherization had been stopped 25 c.c. mashed potato mixed with 5 gms. bismuth subnitrate were given. As in the standard normal

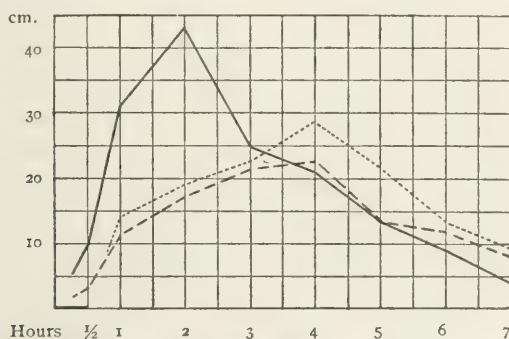


FIG. 3.—Curves showing the aggregate length in centimetres of the masses of potato present in the small intestine at regular intervals for seven hours after feeding. The continuous line represents the normal condition, the dash-line the typical condition after etherization for a half hour, and the dotted line the typical condition after etherization for an hour and a half.

cases, tracings of the shadows of the food in the stomach and intestine were made at the end of the first half hour after the feeding and then every hour for seven hours. The following figures show in centimetres the aggregate length of the food masses in the small intestine at the regular times of observation, in the normal condition and after etherization:

Time in hours	1/2	1	2	3	4	5	6	7
Normal	9.5	31.0	43.0	25.0	21.0	13.5	9.0	4.0
Etherized 1/2 hr.	3.0	11.0	17.0	21.5	22.5	13.5	12.0	8.0
Etherized 1-1/2 hrs.	0.0	14.0	19.0	22.5	28.5	21.5	13.0	9.0

In Fig. 3 is shown graphically the differences between the

aggregate length of the food masses in the intestine under normal conditions and after etherization. It is clear that the anæsthesia alone,—in distinction, for example, from high intestinal operation or thrombosis and embolism accompanied by anæsthesia during the operation,—has a relatively slight effect on the rate of discharge from the stomach. When an animal has been etherized an hour and a half, the chances are that the initial passage of food from the stomach will be for a short time delayed. But whether the anæsthetic has been administered a half-hour or triple that time, the most marked alteration in the passage of the food from the stomach is the slowing of the rate of discharge. The curve rises slowly instead of abruptly. And corresponding to the slow rate of gastric discharge, is a slow passage through the small intestine; the food appeared first in the large intestine, not at the end of two or three hours, as was the case when potato was fed to normal animals, but at the end of four, five and six hours after the feeding—a slightly greater retardation in the cases of etherization for an hour and a half than in the cases of etherization for thirty minutes.

The etherization therefore does not cause an inactivity of the alimentary canal; it seems merely to produce a slowing of the movement of the food through the canal.

2. *The Effect of Exposure to the Air.*—In testing the effect of exposure to the air, the anæsthetic was given for a few minutes over a half hour. As soon as complete anæsthesia was reached a long median abdominal section was made, the abdominal flaps were held widely apart, and the omentum drawn close to the stomach, so as to expose the small intestine and stomach as much as possible. Care was taken not to touch the viscera during these manipulations. Thus the visible surface of the stomach and intestine was exposed to the air, and was kept exposed for thirty minutes. During this time the serosa became dry and lost its glisten. Then the abdomen was closed. After recovery from ether the animals received the usual amount of potato with subnitrate of bismuth. The

following figures represent the aggregate length of the food masses in the small intestine at the regular times of observation, in the normal condition, and after etherization with exposure of the alimentary canal to the air for half an hour:

Time in hours	$\frac{1}{2}$	1	2	3	4	5	6	7
Normal	9.5	31.0	43.0	25.0	21.0	13.5	9.0	4.0
After exposure	8.0	13.5	22.0	29.5	33.5	23.5	17.0	12.0

In Fig. 4 these figures are represented to show graphically the differences between the normal condition and the condition following exposure. It will be seen that the discharge from the stomach is not delayed,—the food begins to pass into the intestine within the first half-hour. The outgo is slow,

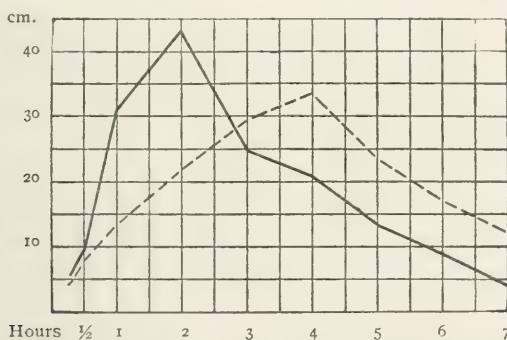


FIG. 4.—Curves showing the aggregate length in centimetres of the masses of potato present in the small intestine at regular intervals for seven hours after feeding. The continuous line represents the normal condition; the dash-line the typical condition following etherization with exposure of the stomach and intestines to the air for a half-hour.

but, curiously enough, not so slow as in the cases of etherization alone. Nothing was seen in the large intestine until the end of six hours—an interval not exceeding that observed when the animals were merely etherized.

As long ago as 1872 Von Braam Houckgeest noted the disturbing effects of drying on the action of the intestines,²⁰ and, in order to study the natural activity made use of a bath of warm normal salt solution. It might be supposed that if gastro-intestinal movements are inhibited during exposure to the air, they might be considerably altered after exposure. Such seems, however, not to be the case. The activities are not

checked; the slowing of the passage of the food through the canal is explained as the normal effects of the anæsthetic.

3. *The Effect of Cooling.*—Not only does drying the surface of the alimentary canal cause a cessation of its movements; cooling the body has the same effect.²¹ Does a temporary cooling of the stomach and intestines, without drying, stop the movements of these organs? In order to answer this question, ether was administered as usual for a half hour, and within that time, for ten minutes, sterile normal salt solution with a temperature of 20° C. was poured at intervals into the opened abdominal cavity. The body temperature, by rectum, was thus reduced to nearly 33° C. About forty minutes after the ab-

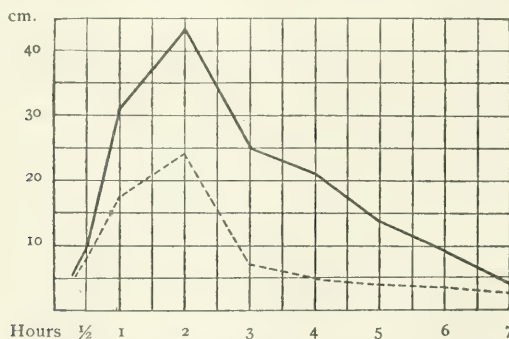


FIG. 5.—Curves showing the aggregate length in centimetres of the masses of potato present in the small intestine at regular intervals for seven hours after feeding. The continuous line represents the normal condition; the dash-line the typical condition after etherization, and cooling of the abdominal cavity with sterile normal salt solution at 20° C. The early drop in the dash-line is due to the rapid passage of the food into the large intestine.

domen had been closed and the etherization discontinued, the animal was given the usual food. In the following figures may be seen the differences between the aggregate length of the food-masses in the small intestine at the regular times of observation, in normal conditions and in a typical case after cooling the alimentary canal:

Time in hours	1/2	1	2	3	4	5	6	7
Normal	9.5	31	43	25	21	13.5	9.0	4.0
After cooling	8.0	17	24	7	5	4.0	3.5	2.5

Fig. 5 is a graphic representation of the content of the

small intestine in the normal condition and after cooling. The discharge again is somewhat slow, but the passage through the small intestine is surprisingly rapid. The first appearance of food in the large intestine in this case was at the end of three hours, and at the end of four hours almost all of the remnant of the food was in the colon. The rapid drop in the curve between the second and third hours is thus explained. It must be admitted that the degree of cooling—to a body temperature of about 33° C.—was excessive. Nevertheless, the departure of food from the stomach was not slower than when the abdominal contents were merely exposed to drying; and certainly the rapid passage of the food through the small intestine lends no support to the supposition that cooling in itself causes enteric paresis.

4. *The Effect of Handling.*—In studying the effect of handling on the functioning of the stomach and intestines, it is desirable to consider different degrees of manipulation. Unfortunately an exact standard of severity of handling is difficult to establish. The experimenter can know that he has taken hold of the gut more or less harshly, and he has to be content with such general characterizations in reporting his results.

In all cases the animals were etherized one half hour, within which the abdomen was opened and the stomach and intestines manipulated. In the most severe treatment of these organs they were stripped between the thumb and first finger with considerable pressure, as would be done in forcing out the contents; in the less severe treatment these organs were fingered gently in air, or in a trickling stream of warm normal salt solution, with the parts protected from the fingers by absorbent cotton wet with the solution; or run through the bare fingers, but wholly within the peritoneal cavity. About an hour after stopping the anæsthetic the animals were fed as in former experiments and the observations were taken at the usual intervals. In the following figures is shown at regular periods of observation the content of the small intestine, in

total lengths of the food-masses in centimetres, under normal conditions and after various manipulations:

Time in hours	$\frac{1}{2}$	1	2	3	4	5	6	7
Normal	9.5	31.0	43.0	25.0	21.0	13.5	9.0	4.0
Under warm salt solution...	0.0	0.0	0.0	11.0	21.0	29.5	24.5	13.5
Gently, in peritoneal cavity...	0.0	0.0	0.0	8.5	9.5	15.5	26.0	23.5
Gently, in air	0.0	0.0	0.0	4.5	8.5	11.0	12.5	13.4
Severely, in air	0.0	0.0	0.0	0.0	3.5	5.5	6.5	9.5

The relation of these typical cases to the normal condition is shown graphically in Fig. 6. In examining the figures and the curves, it should be kept in mind that since neither the etherization alone, nor such cooling and drying

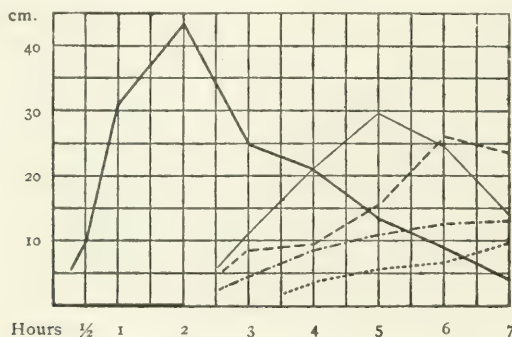


FIG. 6.—Curves showing the aggregate length in centimetres of the masses of potato present in the small intestine for seven hours after feeding. The heavy continuous line represents the normal condition; the light continuous line the typical condition after handling the stomach and intestine gently under warm normal salt solution; the dash-line the typical condition after handling the organs gently in the peritoneal cavity; the dash-and-dot line after handling them gently in the air; and the dotted line after handling them severely in the air.

as the viscera in some cases suffered, cause a delay in the escape of food from the stomach, the delay must have been due to the manipulation. Even when the stomach and intestines were handled most gently, either under warm normal salt solution or within the peritoneal cavity, no movements of the stomach were seen, and no discharge into the intestine, for three full hours after the feeding. Even after the first departure of food from the stomach the discharge continued very slowly as shown by the sloping of the curve; and the passage

through the small intestine was also retarded. In only one case did food appear in the large intestine before the end of the seven hours of observation.

When the organs were removed from the abdomen and handled gently in air the movement of the food was retarded to a greater degree than when they were fingered in the peritoneal cavity or under warm normal salt solution. So great was the retardation that in the case recorded on the above table not all the food had passed into the large intestine from the ileum even twenty-six hours after the feeding. Indeed, the condition then was that reached under normal conditions in about five hours.

With rougher treatment in air food was first passed from the stomach only after four hours. Thenceforward it departed very slowly and, as shown by the permanence of position from observation to observation, was carried through the small intestine with extreme sluggishness. In one case of severe manipulation no food had left the stomach at the end of seven hours. And in another case the food had not yet reached the large intestine twenty-four hours after the feeding (the food used begins to appear there normally at the end of two or three hours) ; only a slight amount of food was in the small intestine, and the stomach was still well filled.

Manipulation of the stomach and intestine, even gently and under most favorable circumstances, produced in our experiments much greater effect in the direction of postoperative inactivity than any other of the factors concerned in the manner of operating. Whether the manipulation produces its effects directly on the mechanisms in the wall of the alimentary canal, or indirectly through reflex inhibitions from the central nervous system, remains to be determined. Goltz's success in stopping the frog's heart by tapping on the intestines ²² suggests that the intestine may be sensitive to mechanical treatment to a degree not commonly realized; and this sensitiveness might very readily result in the same sort of reflex inhibition that occurs when a testicle is crushed.

It should be kept clearly in mind that the animals used in these observations were vigorous normal specimens. Furthermore it may well be that the intestine of these animals is normally less sensitive to stimulation than the human intestine. It seems probable therefore that what is true of these experimental animals is also true of man, but to a greater degree. And when the strength has been sapped and the bodily vigor lost, the factors which operate to check the activities of the alimentary canal must have a greatly increased effect. During the course of other researches on the movements of the food in the stomach and intestines one of us (C.) has had repeated opportunity to observe animals in conditions of asthenia, animals suffering from distemper, with purulent inflammation of nose and eyes, with soft toneless muscles, and every appearance of debility. Nothing is more remarkable than the responsiveness of the alimentary canal to such a condition. All day long food will lie in the stomach without the slightest sign of a peristaltic wave passing over it. There is a total stoppage of the motor activity of the digestive organs. In asthenic states leading to such conditions the handling of the alimentary canal, which we find produces the most marked paralyzing action, can only cause an intensification of the effect of the general bodily weakness, a deepening of the state of inactivity.

SUMMARY

In studying the movements of the stomach and intestines in some surgical conditions, animals were etherized usually one half-hour, operated upon, and subsequently fed food mixed with a small amount of subnitrate of bismuth. Fluoroscopic observations of the changes in the contents of the alimentary canal were then made by means of the Röntgen rays.

After high intestinal section and suture, gastric peristalsis is not interfered with. But for almost six hours after recovery from the ether the pylorus remains tightly closed against the peristaltic pressure and does not permit the food to pass into the injured gut. There is a striking coincidence between the

duration of the delay of the discharge from the stomach and the period of primary cementing of intestinal wounds.

After end-to-end suture of the severed intestine no inefficiency of the gut in the region of suture was observed. But after lateral anastomosis there was always an accumulation of food in the chamber formed by the apposed loops. The cutting of the circular fibres in this operation destroys efficient peristalsis at the junction unless the circular muscles of both loops work in coördination. As they do not so act, at least for days and probably for weeks, following operation, lateral anastomosis is not so ideal an operation as the end-to-end union.

In case of intestinal obstruction, food leaves the stomach without delay. As it accumulates above the obstruction violent peristalsis repeatedly occurs, tending to force the food past the obstacle. The peristalsis alternates with vigorous segmenting movements. After such turbulent treatment the food has been observed moving swiftly *backward* to the stomach along the course traversed in its passage from the stomach to the region of obstruction.

After thrombosis and embolism there is usually no movement of stomach or intestine; the food lies quiet in the stomach until discharged by emesis. In one case gastric peristalsis was observed for some hours and a slight amount of food was discharged into the intestine, but it gathered above the infarcted region and was not advanced further.

In studying the conditions attending operation as possible causes of postoperative paralysis of the alimentary canal, etherization, one half or one and a-half hours, was found not to delay to any marked degree the discharge of food from the stomach; exposure to the air and unusual cooling of the gut likewise caused no noteworthy delay; but by far the most striking effects were seen after handling the digestive organs. Even with most gentle handling, within the peritoneal cavity or under warm salt solution, no gastric peristalsis was seen and no food left the stomach for three hours. Fingering gently in the air caused still greater retardation of the movement of the food.

And with rough handling in air no food passed from the stomach for four hours, and then it emerged very slowly and was moved onward with every evidence of extreme sluggishness of the intestine.

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THE TECHNIQUE OF GASTROJEJUNOSTOMY.

BY WILLIAM J. MAYO, M.D.,

OF ROCHESTER, MINNESOTA,

Surgeon to St. Mary's Hospital.

THE mortality of gastrojejunostomy is no longer the question. The results are as good as can reasonably be expected, and depend more upon the condition of the patient when operated upon than the technical difficulties of the operation itself.

This is particularly true of the posterior-suture operation, of which variety we have made 136 in 16 months with but one death. These results are not exceptional and have been and are being duplicated by many others. Neither need we consider those serious cases of regurgitant vomiting of biliary and pancreatic secretions during the first week (vicious circle), as this complication has practically disappeared with the evolution of better methods.

While we therefore can congratulate ourselves upon the immediate safety of the operation itself, we are not yet free from certain embarrassing complications which may arise some days or weeks later. The most common subsequent condition is the chronic regurgitation of bile which comes on at intervals in a small percentage of patients. The symptoms vary from a temporary burning in the stomach, due to the entrance through the fistula of biliary and pancreatic secretion, to the most distressing vomiting of great quantities of such fluids. Ochsner has pointed out that if this complication develops it is usually within ten weeks of the operation. On reoperation the condition is found to be due to a partial kinking or obstruction from twisting, adhesions or other cause, just as the acute "vicious circle" was due to early and more complete obstructions.

Since January 1, 1905, Dr. Charles H. Mayo and myself

have discarded all "loop operations" with or without entero-anastomosis or closure of the pylorus, the anastomosis being made as close to the origin of the jejunum as possible. The results as compared with all previous methods in our hands have been infinitely better in every respect. The few "loop" operations that have been performed during this time have been to meet special indications.

From January 1 to July 1, 1905, there were 56 of these "no loop" operations with but one death, which occurred in a patient practically moribund at the time of operation. Two patients, however, developed chronic bile regurgitation of a serious character. These two cases are the ones referred to in a paper on "Chronic Ulcer of the Stomach and First Portion of the Duodenum," read before the American Medical Association, July, 1905, and published in the *Journal of the American Medical Association*, October 19, 1905. Each had gained in flesh and weight, being relieved of former symptoms, but in each occasional regurgitation of quantities of biliary and pancreatic secretions was a source of great discomfort and considerable disability. Reoperation in both cases during the past summer showed that the cause of the trouble was an angulation of the jejunum at its gastric attachment.

In all of the 56 cases referred to the anastomosis of the jejunum to the stomach was made in the line of peristalsis, that is, the proximal portion of the jejunum was attached to the posterior gastric wall to the left and above, and the distal end of the jejunum to the right and lower part of the stomach. In this partial twisting lay the secret of the complication. (Fig. 1.)

The question at once arises. Is the idea of continuity of peristalsis between the stomach and jejunum a matter of theory or has it some practical significance? The writer has gone over in a large number of living subjects the anatomy of this region, and the anatomical facts can be briefly stated as follows:

For convenience we will take the origin of the jejunum as being at the point in which the duodenum passes through

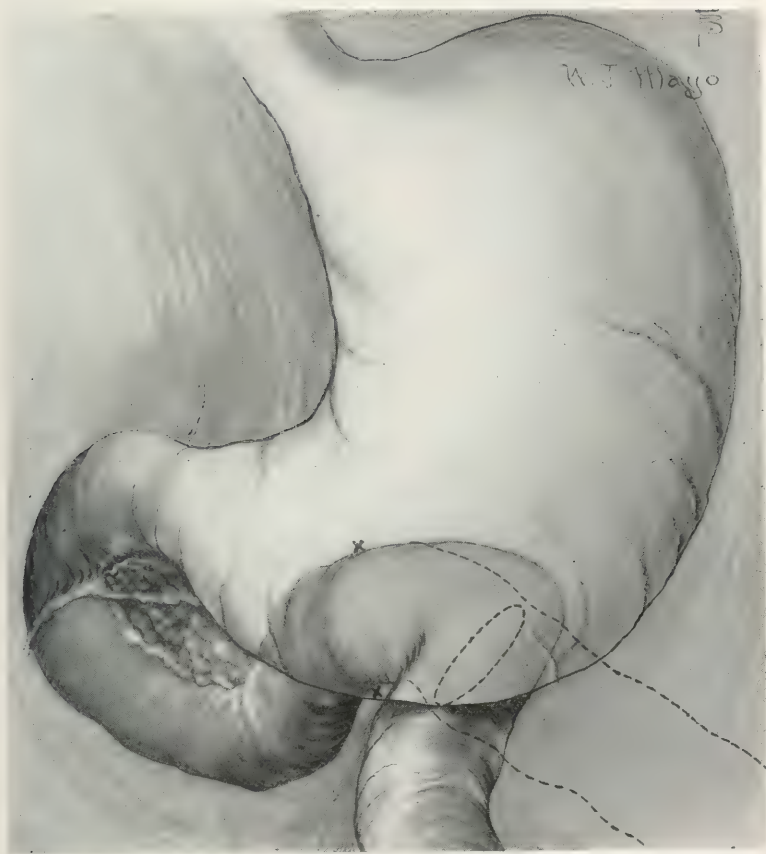


FIG. 1.—Showing kink in jejunum resulting from changing normal direction of its uppermost portion, in "no-loop" gastro-jejunostomy after posterior method.
X and x mark commencement of jejunum.

the transverse mesocolon. The distal end of the duodenum lies behind the stomach when the latter is moderately distended and about one and one-half inches to the left of the middle line and one and one-half to two inches above the umbilicus. Its horse-shoe shape has its concavity directed to the left and upward and its exit is within about two inches as high as the pylorus. The transverse portion of the duodenum passes forward over the prominent vertebral column and backward to the left side of the spine to the opening in the transverse mesocolon. The terminal inch which marks the duodenojejunal juncture is directed upward and to the left, the mesentery of the proximal jejunum lying behind and the free surface of the intestine directed forward. The jejunum from its origin drops at once into the left abdominal fossa. Not only does it pass to the left but it gravitates backward into the left kidney pouch underneath the splenic flexure of the colon, so that at a point four inches from its origin it lies on a plane to the left and posterior. This can be shown in a very practical way by drawing the transverse colon out through the abdominal incision, pulling it upward and to the right until the mesocolon is taut. This brings the beginning of the jejunum into view. It will readily be seen therefore that if the attachment is made to the stomach so that the proximal portion of the gastrojejunostomy is to the left and above, and the distal portion is directed to the right and below, we have introduced two serious displacements. The jejunum no longer falls in the normal manner to the left and backward, but is artificially caused to pass not only to the right but forward as it must ride the vertebral column or the structures immediately contiguous.*

The active propulsion of the stomach lies in the pyloric end in that part bounded above by the horizontal portion of the lesser curvature. The five-sixths lying to the left has mainly storage function and its muscular action is less forceful. The proper site for the gastric incision is to the left of this point

* For variations in the origin of the duodeno-jejunal angle see Mumford, Fustut and Cunningham.

on a line with the longitudinal part of the lesser curvature with its lower end at the bottom of the stomach (under the cardiac orifice).

The writer has been unable to see that it made any difference in the results of a "no loop" gastrojejunostomy whether the peristalsis of the stomach is the same as that of the intestine or not, as, with the exception of a tendency to contraction, there have been no complications introduced that have been other than intestinal in origin.

Since the first of July, 1905, we have abandoned reversing the jejunum and in a larger number of cases (65) we have had not a single case of trouble and no death. We apply the jejunum to the posterior wall of the stomach from right to left exactly as the intestine lies under normal conditions. The distal portion of the jejunum passes from the bottom of the stomach directly back into the left fossa as occurs normally (Fig. 2).

The two accompanying drawings by Miss Byrnes from sketches by Dr. John F. Binnie from actual operations at our hands explain the mechanical conditions very perfectly. It is hardly necessary to say that the idea of the reversal of the peristalsis is not original with us, but will be found in the literature on this subject to have been advocated at various times. As a matter of fact, in this operation it is of no importance.

With any "loop" operation (four inches or more in length) the objections which we here make to the mechanics are not so apparent, but mechanical difficulties of some kind are so frequently introduced as to render gastrojejunostomy with entero-anastomosis the method of choice with the larger number of operators.

The "no loop" operation directed to the left, as outlined above, has given us vastly better results than any other method with which we have become acquainted.

Steps of the Operation.—For benign disease the abdomen is opened from three-fourths to one inch to the right of the

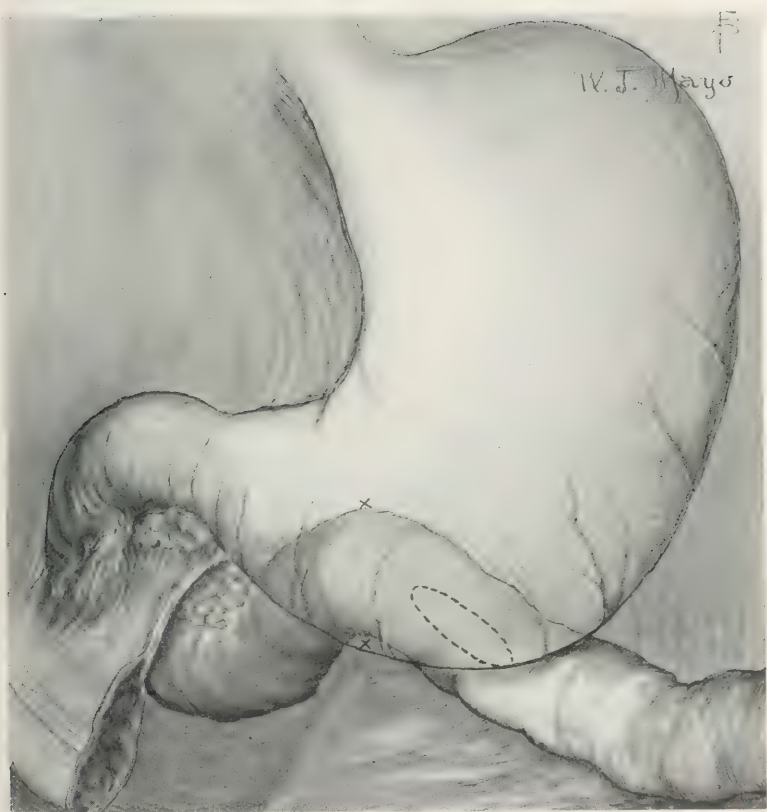


FIG. 2.—Showing NO kink in jejunum resulting from PRESERVING normal direction of its uppermost portion, in "no-loop" gastro-jejunostomy after posterior method.
X and x mark commencement of jejunum.

median line, splitting the fibres of the rectus muscle. The transverse colon is drawn out of the abdominal incision and by a steady traction to the right and upward the mesocolon is brought out until the jejunum comes into view, and the intestine is grasped at a point three or four inches from its origin. On drawing the jejunum tight the fold of peritoneum which covers the ligament of Treitz (a small band containing muscle fibres) is developed. This peritoneal band has its origin on the transverse mesocolon and extends down on to the beginning of the jejunum, acting as a suspensory ligament; it will be found to lead to the base of the vascular arch of the middle colic artery, and accurately marks the place where the transverse mesocolon is torn through to secure the posterior wall of the stomach. The stomach is drawn through this opening and the anastomosis performed, beginning at a point one inch above the greater curvature on a line with the longitudinal portion of the lesser curvature and ending at the bottom of the stomach, two and one-half inches to the left. To secure a proper low point a small opening is made in the gastrocolic omentum and one-half inch of the anterior wall pulled through behind. Having these features in view a considerable portion of the posterior wall is drawn into a pair of light elastic curved holding clamps. We prefer the Doyen. The handles lie to the right and about transverse with the axis of the body. Beginning one and one-half to three and one-half inches from its origin the jejunum is drawn into a similar pair of clamps with handles to the right. It will thus be seen that the left low point on the stomach lies in the tip of the clamps and the distal point of the jejunum lies also to the left. By placing the two clamps side by side the operation is completed in the usual manner by two-row suturing, chromic catgut-suture being used for the inner through-and-through mucous stitch, as silk or linen may hang ulcerating for months before passing away. In applying this suture on the posterior row behind we use the Connell or buttonhole suture. On the anterior we use the method advised by Dr. Charles H. Mayo, which con-

sists in entering the needle on the peritoneal side through to the mucous and directly backward from mucous to peritoneum on the same side. By doing this alternately, first on one side and then on the other, with this first chromic catgut-suture the peritoneal surfaces are rolled into contact, the parts to be united are held firmly in apposition, and the hemorrhage checked. The outer row consists of No. 1 celluloid linen (Pagenstecher), which we have used with great satisfaction since it was introduced for this purpose by Mr. Robson. It is very strong, smooth and has no capillarity. Flattening the intestine (Cannon and Blake) should be avoided by grasping the intestinal wall close to the margin of the incision with the suture so as to turn in a narrow seam from the intestinal side. On the gastric side on the contrary, there need be no hesitation in taking a free grasp of the tissues. The rent in the mesocolon is fastened to the suture line with three or four mattress-sutures of linen. This should grasp the peritoneal coat close to the margins of the rent in such manner that when tied all the raw surfaces shall be turned in behind the stomach, and the peritoneum folded smoothly against the gastrojejunostomy opening so that there shall be nothing to cause adhesions to form between the mesocolon and the jejunum beyond the anastomosis.

This short communication is to supplement the paper on "Gastro-enterostomy" read before the American Surgical Association, July, 1905, and published in the *ANNALS OF SURGERY*, Nov. 1905, in which article credit has been given to originators and promoters of useful suggestions in perfecting this operation.

THE RELATIVE VALUE OF CECOSTOMY AND APPENDOSTOMY IN THE TREATMENT OF AMEBIC DYSENTERY BY IRRIGATION OF THE COLON.

BY HOLTON C. CURL, M.D.,

SURGEON, UNITED STATES NAVY,
Superintendent, Colon Hospital, Isthmus of Panama.

AMEBIC dysentery is of sufficient interest to military surgeons and to those working in the tropics to warrant a thorough study of it from all standpoints. The etiology and symptomatology have been quite thoroughly studied, and preventive medicine has, in many places, been of the greatest benefit in lessening the number of cases in a given locality. The results of the treatment, however, are as yet unsatisfactory. Remedies given by mouth are not efficient and, in many cases, irrigation per rectum is unable to control the disease. The use of irrigating solutions introduced in the region of the cecum was begun some two or three years ago and its exact place in surgery is still undetermined. Our experience with the operation at the Colon Hospital has been interesting as well as instructive. We have reached the conclusion that the operation is not justified in late cases where there is great prostration and great changes in the mucous membrane and submucous tissues of the large intestine. On the other hand, early cases can be controlled by irrigation per rectum, combined with proper diet and rest.

There remains an intermediate class in which ordinary treatment is unavailing, where there is an increasing number of stools daily, where considerable strength remains but patient is weakening. These cases grow worse and usually die. It is in this class only that I consider the operation indicated.

As to the technique, two methods are in use: (1) By the formation of a fistula directly into the cecum and the irrigation

of the colon through a catheter inserted into the gut; and (2) by the use of the appendix, the catheter being introduced *through it, neither operation is in itself dangerous in the least*; with ordinary aseptic care, there is little reaction and adhesions are readily formed. Occasionally the appendix, from its position, cannot be brought up without making too much tension on the cecum. There is little difference in the difficulties ordinarily presenting themselves, and but a few minutes are required for the completion of the operation. On several occasions I have gone down to the peritoneum under cocaine, and completed the operation by the use of a very little chloroform.

Of the two methods, I prefer the cecostomy as done by the simple gridiron method and the gut fastened by a continuous catgut-suture to the parietal peritoneum. The four "corners" of the wound (that is, where the angles are formed by the two edges of the external oblique crossing the internal oblique) are anchored by sutures passed through both muscles and the peritoneum. These are usually of silk, left long, and are very convenient in exactly locating the point at which to open the gut. This can usually be done after twenty-four hours, but if there is no special urgency, forty-eight hours' time is allowed. The opening should be only large enough to admit a catheter of small size, through which the quinine solution can be introduced. The catheter can be left in position with a clamp to prevent leakage, or it can be replaced by a conical pad and reintroduced when desired. The closure of this class of openings is sometimes difficult, but usually they heal kindly after the planes of muscle are dissected out, the gut inverted and closure carefully done.

In the use of the appendix, various methods were tried by us: (1) It was brought out through the internal oblique, given an "J" shaped turn, and brought out through the external oblique and skin through an opening below; (2) it was brought directly through the entire wall and sutured to the skin; (3) it was brought well into the wound and the base of the appendix sutured to the parietal peritoneum. The



FIG. 1.—Photograph of a typical case of cecostomy for dysentery taken on the 12th day; the usual slight sloughing is well indicated. This man entirely recovered.

results were not as satisfactory as in the cases in which the cecum proper was used; the circulation in the appendix, even when most carefully handled, was uncertain and, in three cases, the organ sloughed. There is a certain amount of secretion from the mucous membrane of the appendix, which tends to prevent any spontaneous closure of the sinus, and it was more difficult to close these wounds, when the need for the irrigation no longer existed, than in the other class of cases. On the other hand, there is a decided advantage in being able to immediately irrigate the colon, if the case is an urgent one, even while the patient is on the table.

In the cases in which the appendix was not used for irrigation, it was removed merely as a precautionary measure. The ordinary normal appendix,—and such are almost invariably found among the negro and native population of the Isthmus,—will admit a small catheter very readily, much more so than one would think unless his attention had been especially called to it.

In eight cases out of eleven there was partial or complete recovery. In two cases the conditions, as demonstrated at autopsy, were those of very extensive ulceration, and both had nephritis. One case was so weak that the operation was done almost entirely under cocaine, there was very little depression afterward, but death occurred before the opening of the gut could be done on the next day.

In the cases that recovered, the record of stools on the day before operation showed from 12 to 30, and in the two who died soon after operation, the movements were uncontrolled and practically continuous. In seven cases the stools dropped to one or two on the fourth day, and in three cases, there was but one stool on the third day. These three had had, respectively, 12, 15 and 22 stools, with blood and mucus, on the day prior to operation. While immediate improvement took place, convalescence was slow and more than one operation was needed in closing the fistulæ in four of the patients. Relapses,

after negative stools for some weeks, occurred in three cases; further irrigation again cleared up the condition.

In one case in which there was clinically a complete cure, an opportunity for autopsy was secured by the patient's death from beri-beri three months later. The gut was found in excellent condition, the sinus closed and a broad, firm attachment of the cecum to the abdominal wall.

SUMMARY.

In "intermediate" cases, in which there is still a reasonable amount of strength but where treatment is not controlling the dysentery, the operation of cecostomy with irrigation of the colon with quinine solution is indicated. Cecostomy is preferred to appendostomy because of less sloughing and an easier closure of the fistula. The appendix should be removed at the time of fastening the cecum in the abdominal wound.

A rapid improvement usually follows the beginning of irrigation, but convalescence is slow, and at times difficulty is experienced in closing the fistulæ. The after treatment,—irrigation, etc.,—is tedious, and the patients are offensive cases to have in a ward. All in all, it is the lesser of two evils, but in my opinion, it saves lives in selected cases.

THE USE OF SILVER WIRE FOR THE CURE OF LARGE HERNIÆ.¹

BY JOSEPH WIENER, JR., M.D.,

OF NEW YORK,

Adjunct Attending Surgeon, Mount Sinai Hospital.

THE object of writing this paper is to draw attention to a somewhat neglected field of reparative surgery. I confess that when I first began to use silver wire for the cure of herniæ I was skeptical as to its value. The more I have used it, the more convinced I have become of its great value. True, there are certain technical points which must be borne in mind to get the best results. Increasing experience in this respect has taught us valuable lessons.

The subject was first brought to our attention by Witzel and Goepel, almost simultaneously, in 1900. Though almost six years have elapsed, with the exception of articles by Willy Meyer, Bartlett, and Perry, but little has been written on the subject. Witzel used a number of sutures of silver wire with which he partly closed the hernial opening, and he then passed thin silver wires in every direction across the opening still remaining. This was a tedious and time-consuming method. Goepel was the first to employ the ready-made filigree of silver wire. He reported eleven cases of ventral and umbilical and seven cases of inguinal hernia, in which he had used the filigree. There were only two failures, due to the formation of hæmatoma, which necessitated the removal of the filigree. If all bleeding be carefully arrested no hæmatoma will develop. Furthermore, we now know that even if there is some infection of the wound, with a resulting sinus, the filigree need not be removed. The wound will ultimately heal and the filigree remain in place. The largest filigree used by Goepel was four

¹ Read before the Surgical Section of the New York Academy of Medicine on February 2, 1906.

and a-quarter by six and three-quarter inches. This gives an idea of what the filigree can do in the cure of herniæ.

My interest in the subject was first aroused by an excellent and convincing paper by Bartlett, which appeared in the *ANNALS OF SURGERY* in 1903. The filigree I have employed has been that devised by Bartlett, and I have followed his directions closely. He advised the use of the ready-made filigree, made of thin wire, not heavier than gauge No. 30. The heavier wire is not resilient enough, and does not adapt itself so well to the tissues, and in consequence it is apt to cause irritation. Another advantage of the filigree over silver-wire sutures is the fact that it can be introduced very quickly. Furthermore, and this is a matter of great importance, the filigree can be placed between the tissues at a much greater distance from the edges of the opening than would be possible in passing a needle. It should widely overlap the hernial opening on all sides. No sutures are required to hold the filigree in place. If anyone doubts the correctness of this statement, he has but to remember what happens when we inadvertently leave a piece of gauze in a wound. How quickly are the meshes of the gauze filled with granulation tissue, which anchors it in place so firmly that it can only be removed with the greatest difficulty. The same process goes on with the filigree. In a few weeks it is so firmly anchored in place that great force is required for its removal. This has been proven experimentally on animals. Another advantage in not suturing the filigree in place is the fact that it can then better adapt itself to the surrounding tissues, and there is less likelihood of its causing any irritation. If properly made and properly inserted it should cause no discomfort whatever; the patient should not be aware of its presence.

The form of filigree used by the writer has been that devised by Bartlett, and described in his article in Volume 38, *ANNALS OF SURGERY*, 1903. As is well known, scars in the abdominal wall generally spread most in a lateral direction. The filigree, which can be readily made by anyone,

depends for its efficacy upon the fact that all but one of the wires run across the long axis of the hernial opening. The filigree should overlap the opening by at least an inch all around. It is so made that each cross-wire ends in a loop, thus obviating sharp ends. If sutures of silver wire are used, they should not attempt to approximate the tissues (a frequent cause of failure). The sutures should be made into a sort of filigree, they should fill in the gap of the hernial opening, and there must be no tension whatever. It is always better to depend on two layers of silver; either two filigrees in two different planes, or one filigree and one reinforcing layer of silver sutures, provided the superficial muscles or fascia can be approximated without any tension. In general it is well to place the filigree as deeply as possible; sometimes it is not necessary to open the peritoneal cavity. But the filigree must extend well beyond the hernial opening on all sides. This necessitates dissecting up the muscles all around before introducing the filigree. Then the superficial plane of muscles or fascia may be united with silver-wire sutures, or a second filigree is introduced. Or, a filigree can be made by a running suture of wire that does not approximate the tissues, but simply fills in the gap. By following this method we have a double guard against recurrence of the hernia.

To show that by this method a hernia can be cured even in the presence of intra-abdominal tension which has been increased by pathological processes, reference may be made to two cases of Bartlett's. One was a case of hernia following Talma's operation for cirrhosis, and the other was a case of tubercular peritonitis. In the former case, in spite of the fact that there had several times been a decided reaccumulation of fluid, the filigree prevented the recurrence of the hernia. Of the ten cases in which Bartlett used it, he has never had to remove it, and he has observed some of his cases over two years.

The writer has used either the ready-made filigree or one made with running silver-wire sutures. Five of the cases were in the service of Dr. Howard Lilienthal, to whom I am

indebted for permission to publish the cases. In a private case the wire was used for a ventral hernia following a median cœliotomy. Fifteen months have elapsed and the patient has not only been cured of a troublesome hernia, but also has been free from any discomfort due to the presence of the wire. In two cases there were large inguinal herniæ with wide separation of the tissues. One case was an umbilical hernia, one a ventral hernia following an injury, and one a ventral hernia following an operation for appendicitis. In no case has it been necessary to remove any of the wire.

CASE I.—Israel M., 53 years old, was first admitted to Mount Sinai Hospital in November, 1902. There had been a gradually-increasing right inguinal hernia for three years. The hernia had been irreducible for one year, and there had been several attacks of abdominal pain. On admission, the hernia was 58 cm. in circumference, and being only partly reducible it interfered with walking. On opening the sac, Dr. Lilienthal found it to contain small intestines, cæcum and ascending colon, the latter firmly adherent to the sac. The adherent appendix was removed. The sac was so firmly adherent to the cord and testis that their detachment was impracticable. Accordingly, the testis, cord, and part of the sac, were removed; the intestines were replaced and the neck of the sac closed with chromic gut. The reduction of the intestines proved a difficult and tedious task, as more than half of the small intestines were in the sac. No sutures were used; the wound was packed with gauze and a compression bandage was applied. During the convalescence there was some sloughing of the fascia and of the deeper tissues. A large exudate which formed in the scrotum necessitated incision. Two and a half months after operation the man left the hospital with a healed wound. He was instructed to wear a truss and to return for observation.

Six and a half months later the man returned to the hospital. He stated that the hernia which could no longer be retained by a truss, was becoming progressively more troublesome. It was only partly reducible, and prevented the man from earning his living. Even when the dangers of the operation were explained

to him, he begged for relief. On August 19, 1903, I excised the scar tissue and opened the sac. It was found impossible to reduce the many coils of small intestine until the patient was placed in Trendelenburg's position. Even then it was only with great difficulty that the intestines were replaced. The sac was then freed from adhesions, tied off and allowed to slip back into the abdomen. The inguinal canal was so large that any approximating sutures were not to be thought of. The inguinal ring was narrowed by a purse-string suture of silver wire. A silver-wire filigree was now sutured over the inguinal canal, and the superficial fascia and skin brought together with interrupted sutures. A small gauze drain was left at the lower angle of the wound. Following the operation, the attempt was made to keep the foot of the bed elevated. On attempting to elevate it much the man complained of nausea and retching, and he became short of breath and cyanosed. Although the bowels moved daily, the patient was never comfortable. He became more and more restless and three days after operation he began to vomit. This continued, cyanosis and increased restlessness developed, and the man died six days after operation. Examination of the wound showed that the filigree was in place and that there had been no infection. Death was undoubtedly due to the fact that the abdominal cavity could not accommodate itself to the large amount of intestines which had been in the sac. Some of these large inguinal herniæ can surely be cured by the use of silver-wire filigree when all other methods are of no avail.

CASE II.—Mrs. Ray M., 34 years old, was referred to me by Dr. Louis Cohn. In October, 1900, she had been operated on by Dr. Bull, who removed diseased adnexa through a median incision. Drainage had been employed at the lower angle of the wound. Five months after the operation a hernia first showed itself at the lower portion of the scar. In July, 1901, the patient had a sudden attack of pain in the right side of the abdomen, accompanied by vomiting and fever. The attack lasted a week, and had been followed by a number of similar ones. The hernia gradually increased in size; it became painful and could no longer be retained by a truss.

Hernioplasty, October 27, 1904. The sac was opened by a transverse incision four and a half inches long and a median

incision two inches long. It contained a large mass of omentum. The neck of the sack was slightly to the left of the median line, but the hernial protrusion had lifted up the skin in front of the left rectus, and extended nearly in the flank. The omentum was replaced, the appendix removed, the sac completely dissected out, and tied off at its neck. The peritoneum was closed with a running catgut suture. The posterior sheaths of the recti and the muscles themselves were approximated with chromic gut sutures. The fascia could only be partly approximated without tension. The gap was filled in with silver wire sutures passed from side to side so as to produce a filigree. The skin was sewed with silk, and a cigarette drain placed at either angle. The wound healed by primary union. Sixteen months have elapsed since the operation; there has been no recurrence, and there has been no discomfort from the silver wire.

CASE III.—William K., 30 years old, admitted January 6, 1905. The man had had an oblique right inguinal hernia for three years, and a similar hernia on the left side for one year. Operation on the right side by Dr. Lilienthal. For the Bassini sutures, instead of chromic gut, twisted silver-wire sutures were used. The operation on the left side was performed by the writer. There was such a wide separation of the deeper structures that it was impossible to approximate them. Accordingly, the gap was bridged over by a continuous suture of silver wire, returning the suture so as to make a sort of figure-of-eight filigree. The superficial fascia was united with catgut and the skin with silk. Both wounds healed by primary union. It will very seldom be necessary to resort to the silver wire in cases of inguinal hernia, but when we have such a case, the silver wire, if used as a filigree and not as approximating sutures, will be found satisfactory. The silver wire used in this case was in the form of a cable of very thin wires, and was devised by Dr. Lilienthal. It is much more pliable than a single strand of heavier wire, and can readily be tied into a knot.

CASE IV.—Louis R., 37 years old, admitted May 5, 1905. Two months before admission the man, while getting off a moving car, was thrown against a steel column. He sustained a fracture of the humerus, dislocation of the clavicle and three upper ribs, and a large ventral hernia in the left iliac fossa. On May 9 I

performed a partial excision of the clavicle and three upper ribs. Eight days later I exposed the ventral hernia through a three-inch transverse incision. The peritoneum was not opened. A silver wire filigree two by three and a half inches was placed between the peritoneum and the transversalis. The external oblique was approximated with a running suture of silver wire, and the skin with silk. The wound healed by primary union, and the man has suffered no discomfort from the wire.

CASE V.—Tony M., 24 years old, admitted July 10, 1905. In 1901 the girl had been operated on for appendicitis. A year later a hernia developed in the scar; it had always been reducible until two weeks before admission. At that time the mass suddenly increased in size, the bowels could not be moved and vomiting set in. The hernia was five inches wide and three inches long. On the surface of the mass there were several small ulcers. Operation, July 12, 1905. Hernioplasty with resection of gut for large ventral hernia with gangrene of gut. The hernia was found to consist of several loops of firmly adherent small intestine. One loop had perforated the skin and formed the large ulcer on the surface of the skin. On account of its poor condition six inches of this loop, together with the adherent skin, were resected. End-to-end anastomosis with the Connell suture was done. The circulation in the adjacent portion of the gut was none too good, and accordingly two pieces of rubber dam were placed around the suture line. As the patient's condition was not very good, and as the operation had already consumed considerable time, it was decided to use silver wire to close the abdominal wall. The hernial ring was freed as well as possible and through-and-through silver-wire sutures were passed from side to side. In this way the greater part of the opening was closed. The rubber-dam drains emerged at the centre of the ring. The skin was sutured with silk. For two weeks there was a fecal discharge from the wound. Thereafter the wound healed steadily, and the patient left the hospital with a completely healed wound on August 16, 1905. Since then the girl has been doing arduous housework, including the lifting of heavy weights and the scrubbing of floors, without any pain or discomfort.

CASE VI.—Golde B., 30 years old, admitted October 3, 1905. The patient had an umbilical hernia of five years standing. Five

days before admission the hernia for the first time had become irreducible. The bowels could not be moved, and vomiting set in. The hernia was the size of an orange, tense and tender. Operation on October 3, 1905. The sac was filled with omentum and one loop of small intestine. The intestine was replaced and the omentum resected. Three sutures of silver wire almost completely obliterated the diastasis at the neck of the sac. A few catgut sutures approximated the superficial tissues. A small cigarette drain was introduced and the skin sutured with silk. The wound was entirely healed in sixteen days. It would not have been possible in this case to have brought the fascia together in any other manner. Three months later after a severe attack of bronchitis the patient developed a small hernia just below the umbilicus. Had I put in a filigree besides the silver-wire sutures, this would not have occurred.

CASE VII.—Mary M., 27 years old, admitted October 3, 1905. Two weeks before admission the woman noticed a mass in the right hypochondrium and epigastrium. The mass was hard, smooth, adherent to the abdominal wall, and measured about three by five inches. On January 31, 1906, the tumor was excised through a vertical incision in the right hypochondrium. The tumor involved the right rectus and the adjoining portions of the oblique muscles; it was also adherent to the parietal peritoneum. Portions of the oblique muscles, the rectus together with both its sheaths, and the adherent peritoneum, were removed with the tumor in one piece. It was only with difficulty that the peritoneum could be brought together with catgut sutures. A filigree was then placed in the depth of the wound, and a second filigree made by passing running sutures of silver wire through the oblique muscles. A drain was introduced at either angle, and the skin approximated with zinc oxide plaster. Recovery was uneventful. The pathologist of the hospital, Dr. Mandlebaum, reported the tumor to be an inflamed fibroma.

The writer believes it can be safely said that if the silver-wire filigree be correctly made and correctly introduced, it will seldom be necessary to subsequently remove it. If, furthermore, the precaution be taken of introducing two separate

filigrees in different planes, then the large majority of otherwise inoperable herniæ will be radically cured. With careful attention to a few technical details we have in the use of the filigree a rapid, safe, and efficient method of curing large herniæ, and one that deserves, in properly-selected cases, the hearty approval of every surgeon.

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PRIMARY TUMORS OF THE URINARY BLADDER.

A STUDY OF FORTY-ONE CASES AT THE MASSACHUSETTS
GENERAL HOSPITAL.*

BY LINCOLN DAVIS, M.D.,

OF BOSTON, MASS.,

Out-Patient Surgeon, Massachusetts General Hospital ; Instructor in Anatomy,
Harvard Medical School.

THE cases which form the basis of this paper are taken from the clinical records of the Massachusetts General Hospital since 1877, and the autopsy records since 1897. There are included in this series of forty-one cases only primary tumors of the bladder which have been verified by either operation or autopsy. Many cases in which the diagnosis was made by the presence of villous fragments in the urine, or from clinical symptoms, or by the cystoscope, but which for various reasons did not come either to operation or autopsy, are not included. Neither are numerous cases of malignant disease of the bladder, obviously secondary to cancer of the uterus, prostate, or intestines, included.

The object of this study has been :

First. To record such clinical data, as the analysis of a considerable number of cases affords, with special reference to end results after operation.

Second. To investigate the pathological anatomy of the simple epithelial tumors of the bladder, commonly called papillomata, with relation to the ultimate prognosis.

To this purpose the hospital records have been carefully analyzed, and after persistent search, reliable information as

* For the privilege of reporting these cases I wish to acknowledge the courtesy of the Visiting Staff of Surgeons of the Hospital. I also desire to thank Dr. W. F. Whitney, Surgical Pathologist, and Dr. J. H. Wright, Director of the Clinico-Pathological Laboratory, for the use of their valuable material and for kind assistance.

to the histories of patients after discharge from the hospital have been pretty generally obtained; personal interviews were possible in a few cases. All the pathological specimens which were preserved have been reëxamined, and studied in relation to each other, and to the clinical course of the disease.

In thirty-seven of the forty-one cases included in this report, the tumors were removed by operation; in the remaining four cases the condition was found at autopsy. A summary of the cases in the form of a table follows at the end of this article.

ETIOLOGY.

Prevalence.—The fact that in the twenty-eight years since 1877 only thirty-seven cases of primary tumors of the bladder have been operated upon at this hospital, leads one to believe that the disease is a comparatively rare one, at least in this locality.

It is interesting to note that in the same period of time there have been four hundred and forty-two cases of stone in the bladder operated upon. This comparison, however, is not strictly fair, for it is reasonable to suppose that a greater number of cases of tumor than of stone have been overlooked, since the diagnosis of the former condition was, until the perfection of the cystoscope within recent years, rather uncertain, while a perfectly adequate method of diagnosing stone has been known for years. Then, too, doubtless in the earlier years, on account of the greater formidableness of the operation for tumor as compared to that for stone, some of the former cases even if diagnosed may not have been attacked.

By decades the cases of tumor group themselves as follows: 1877-1887, 5 cases operated on; 1887-1897, 14 cases operated on; 1897-1905, 18 cases operated on. The increase since 1897 is not striking, considering the improved methods of diagnosis and operative technique.

That the disease is generally considered a rare one is shown by the much-quoted figures of Küster, who found 10

cases out of a total of 3938 cases of tumors of all kinds operated upon at the Augusta Hospital in Berlin, $\frac{1}{4}$ of 1 per cent. Gurlt collected 66 cases out of 16,637 cases of tumors in 3 large hospitals in Vienna, less than 0.4 per cent.

Albarran, on the other hand, maintains that tumors of the bladder are far from rare, and cites the fact that in Guyon's ward at Necker in 4 years there were 55 vesical tumors, or 3.9 per cent. of all genito-urinary cases there treated.

Sex.—In this series of cases there were 7 females and 34 males, an excess of males slightly less than that reported in other collections of cases. Albarran's figures are 14 per cent. of females in 381 cases. Nitze's figures show a still smaller percentage of females.

Age.—The age at which the patients entered the hospital with the disease has been noted. In decades the cases group themselves as follows: Under 20 years, 1 case; 20–30, 2 cases; 30–40, 2 cases; 40–50, 5 cases; 50–60, 21 cases; 60–70, 7 cases; 70–80, 8 cases. This shows a marked preponderance of cases in the sixth decade, a fact generally noted. The youngest patient was 16 years old, a case of sarcoma; the oldest 73. The average age was 53.

Excluding two comparatively rare forms, myxoma and sarcoma, which occur in childhood, the first exclusively and the second commonly, tumors of the bladder in general, although occurring throughout adult life may be said to essentially belong to the period of middle life, and early old age.

Cause.—The direct cause of tumors of the bladder as of tumors elsewhere in the body is not known. The frequency with which certain cell inclusions have been found in the epithelial tumors of the bladder, has led to considerable discussion of the parasitic theory in connection with their origin.

According to the weight of best authority, however, these cell inclusions can be adequately explained as the products of either cell activity or degeneration, as the case may be, and the parasite remains to be actually demonstrated.

Of predisposing causes several have been advanced from

time to time and seem to have more or less weight. Chief of these is irritation (chemical, mechanical, or bacterial).

That chemical irritation of the bladder has some relation to the formation of bladder tumors seems to be borne out by the prevalence of this condition among workers in aniline factories. A striking number of such cases have been reported by Rehn, Leichtenstern, and Huldshiner. It cannot be doubted, it seems to me, that there is here something more than mere coincidence. That it is more than a contributing factor, however, cannot be claimed in view of the small proportion of cases to which it applies relative to the total number of bladder tumors.

In this series of cases chemical irritation of the bladder seemed to play no part in the causation of the disease, so far as an investigation of the occupations of the patients could determine this point. The occupations were various, and diverse, including all the ordinary vocations of life; sea-faring men, of whom there were five, were for some unaccountable reason in the majority.

The mechanical irritation of stone in the bladder has been considered an etiological factor of importance. Rosenow has collected from the literature 44 cases in which stone was associated with tumor. From a study of the clinical history and post-mortem findings of these cases, he reasons that the stone was primary in 18 cases, and the tumor in 8. He concludes "that contrary to the views of Neelsen, Busse, and others, an etiological relationship between calculus and tumor is not to be denied altogether, and calculus seems to favor the development of tumor in a larger percentage of cases than tumor favors the development of stone."

The latter part of this conclusion is not only contrary to the views of the authors quoted above, but is at variance with the opinions of such authorities as Guyon, Albarran, and Nitze. The former says that it can be affirmed that preceding diseases of that organ (the bladder) or of the urethra, such as gonorrhœa, stricture, cystitis, stone, retention, hypertrophy

of the prostate predispose to tumors of the bladder in no way. Nitze makes a statement to the same effect.

Furthermore, there is considerable evidence that tumor does favor the development of stone in many cases, the secondary changes in the bladder which inevitably sooner or later result from the presence of a tumor, such as inflammation, ulceration, retention, etc., furnishing the very conditions which are most favorable for the formation of a calculus.

The well-known frequency of calcareous incrustation of tumors is evidence of this tendency. It is merely a further step in the same process to the formation of a true calculus about a detached fragment of tumor, and such cases have been reported.

An investigation of cases in this hospital with reference to the association of stone and tumor may be of interest. It is a striking fact that of the 438 individuals who underwent 492 operations for stone in the bladder since 1872, only one (Case XVIII) according to the records, subsequently developed a tumor of the bladder. If others did so the condition was either unrecognized, or treated elsewhere. Among this number there were many cases of recurrent vesical calculi with repeated operations, which were doubtless subjected to the "irritation of stone" in no small degree. It must in fairness be said, however, that in a number of these cases of recurrent vesical calculi there was enlargement of the prostate gland, and that in at least one of them, possibly more, it was afterwards discovered that the gland was carcinomatous. Such cases not being primary tumors of the bladder, are not included in this series, but are mentioned as possibly throwing some light on the difference of opinion which exists as to the association of stone and tumor.

Of the forty-one cases of primary tumors of the bladder, in addition to Case XVIII, already mentioned, there were 7 cases in which there was an association either past or present with true calculus or deposition of urinary salts.

These cases, Nos. I, IV, XV, XVIII, XXIII, XXIX, XXXI, and XXXVI, may be briefly summarized as follows:

CASE I.—A villous tumor of the bladder incrustated with urinary salts was removed by Dr. Warren. No history of previous stone. Death 14 years later. Cause of death recorded in Massachusetts Archives as “renal calculi.”

CASE IV.—Service of Dr. Bigelow. Urinary symptoms for 8 months, with hæmaturia for 2 months. At operation a lithotrite was introduced into the bladder and what seemed to be a soft stone seized and crushed. The evacuator brought out some fragments of stone with blood-clots. A vaginal cystotomy was then done, and a tumor the size of two English walnuts removed from the bladder. The patient died at the end of 7 days.

CASE XV.—This case has been reported in detail by Dr. A. T. Cabot.¹ A brief résumé follows here:

In 1870, in another city, the patient was cut for stone by the lateral perineal route. Frequency of micturition persisted ever after this. In 1884 there was a sharp attack of cystitis, and five years later fragments of stone were passed. In September, 1889, the patient entered the hospital; the bladder was searched for stone, washed out with the Bigelow evacuator, and several small fragments composed of papillary masses of epithelial cells mixed with urinary salts came away. Suprapubic cystotomy was then performed by Dr. Cabot, and a thick, flat, cutaneous-looking sheet of tissue removed from surface of bladder,—“Pachydermia vesicæ.”

In March, 1892, the patient began to have pain in the bladder and frequent micturition again. In July, 1894, he reëntered the hospital with a discharging sinus above the pubes. The sinus was enlarged by Dr. Cabot and the interior of the bladder explored: it was found invaded by a new growth. A small portion which was removed proved to be epidermoid cancer. The patient died a short while later, and at autopsy the bladder, as well as the kidneys, muscles of abdominal wall and retroperitoneal glands, were found to be involved in the disease.

¹ Papers on Genito-Urinary Surgery. “A case of cystitis with formation of a thick epidermal sheet in the bladder,—Pachydermia vesicæ.”

CASE XVIII.—This case also has been reported by Cabot² There was a history of stricture of the urethra, for which no operation was done. Six years later, after an attack of renal colic (?), a few small, pea-sized stones were passed. Eight years later, symptoms of cystitis developed, which steadily increased for a year, until a small stone in the bladder was crushed by Dr. Cabot in 1895. In the course of a few months there were two recurrences of stone, for which there was no apparent cause, as the bladder emptied itself and the urine was acid. In November, 1895, the bladder was opened above the pubes by Dr. Cabot; a stone was removed from the postprostatic pouch, and a little myoma with ulcerated, granulating surface, incrustated with urinary salts was removed. There was no recurrence of symptoms for 2 years. History after this time not known.

CASE XXIII.—Service of Dr. Elliot. Symptoms of cystitis with hæmaturia following confinement 2 years before. Passed several small stones during the preceding year. In May, 1900, the urethra was dilated and two small tumors removed from bladder. In December of the same year she reëntered the hospital with the same symptoms, and a history of having passed blood and some stones. A suprapubic cystotomy was done by Dr. Greenough. A deposit of calcareous matter was curetted off the bladder wall, and two papillomatous masses removed. No history subsequent to the discharge from the hospital could be obtained.

CASE XXIX.—Hæmaturia of 3 months' duration. Papillary tumor incrustated with urinary salts removed by suprapubic cystotomy by Dr. Cabot. No urinary symptoms 2 years later.

CASE XXXI.—Operation 31 years ago at the age of 9 for stone in the bladder. No urinary symptoms from that time until the beginning of the present trouble, 3½ years ago, when he first noticed bloody urine which has persisted intermittently since. In February, 1904, a papillary tumor of the bladder was removed by Dr. Cabot. No stone. In August of the same year he returned to the hospital with recurrence of symptoms. The bladder was reopened by Dr. Conant and found studded with nodular growths, which were curetted out and cauterized. He left the hospital

² Papers on Genito-Urinary Surgery. "Observations upon stone in the bladder."

somewhat relieved. Death from the disease ensued two months later.

CASE XXXVI.—A large fibro-myo-sarcoma removed by Dr. Balch, the lower portion of the growth was incrustated with urinary salts.

Of these 8 cases there were 4 (Cases I, IV, XXIX, and XXXVI in which there was not true stone formation, but incrustation of existing tumors with urinary salts. In these it is evident that the tumor was the primary factor.

In 2 cases (Nos. XVIII and XXIII) it is not possible to determine which was the primary etiological factor. In Case XVIII, the probability of the early stones having favored the development of the tumor, a myoma, is at least offset by the contrary evidence that the late ones were the result of it. Case XXIII is inconclusive through incompleteness of subsequent history.

Two cases (Nos. XV and XXXI) in which the stone was unquestionably primary in point of time, remain to be considered. Case XV was complicated by the rare condition of pachydermia vesicæ, which is of notoriously slow development, and therefore very likely may have antedated both conditions, the persistence of the bladder-symptoms after removal of the stone giving color to this view. Be that as it may, there are at least as good grounds for attributing the tumor, which was epidermoid cancer in this case, to a malignant transformation of the leukoplakia, as to the direct result of a single stone removed 24 years previously.

Hallé, who reported 7 personal cases of leukoplakia of the bladder, in 1896, advanced the theory of the malignant degeneration of this condition. He supported his theory on the evidence of one of his own cases, in which the coexistent lesions of leukoplakia and cancrroid were found, and also on the analogy of a similar tendency in leukoplakia of the mouth.

Of Hallé's 7 cases it is interesting to note that 4 were associated with stone; in 3 of these the stone was evidently secondary in origin, in the fourth case this point could not be determined.

CASE XXXI.—There can be no question but that the calculus was primary in this case, the interval of 26 years, however, between the removal of the stone and the onset of tumor symptoms,—an interval characterized by the entire absence of all bladder symptoms,—makes it hard to believe that “irritation” played an important part in the causation of the tumor.

Among these cases should be mentioned for the sake of completeness 2 cases (Nos. XXXII and XXXVIII) in which the patients gave a history of having passed gravel, respectively, 1 and 2 years previous to entrance to the hospital. In neither of these cases was stone or deposition of urinary salts found in the bladder. The unconfirmed observation of a patient as to the passing of gravel is liable to too many sources of error to be accepted without scepticism, and therefore it seems not worth while to consider these 2 cases further.

As far then as an analysis of these cases goes, it may at least be said that no strength is added thereby to the irritation-of-stone theory.

Under the head of mechanical irritation should be mentioned the effects of the distoma hæmatobium. The occasional association of papilloma, carcinoma and sarcoma with Bilharzia disease of the bladder has been reported by Goebel. Zuckersandl, in his “Handbuch der Urologie,” pictures very beautifully a “Bilharzia papillom” showing numerous calcified distoma embryos in the stroma of the tumor. This source of irritation, like the aniline poisoning, is of great interest, but is necessarily restricted to a very limited field and lies outside the scope of this paper.

Bacterial irritation of the bladder as in cystitis, enlarged prostate, etc., may be dismissed as of no real importance in the causation of bladder-tumors, except possibly in the rare instances of epidermoid cancer. In only a small proportion of cases in this series was there any history of urinary disturbance antedating the symptoms which could be properly ascribed to the tumor itself.

Early gonorrhœa had been present in 6 cases. No sequelæ of that disease were mentioned in the histories except in one case, where stricture of the urethra had been present 15 years previous to the tumor.

In 16 cases it was stated that there never had been gonorrhœa. In 19 cases there were no data as to this point.

Symptoms of cystitis,—that is, frequent and painful urination,—were the first complaints in 15 cases, but the cardinal symptoms of tumor, hæmaturia, followed shortly in all; the only exceptions being Case XVII in which there was a period of 5 years characterized by frequency of micturition and scalding before the onset of hæmaturia; Case XVIII, a myoma, in which hæmaturia was never noted; and Case XL, in which there had been recurrent attacks of pain in the left kidney region for 20 years preceding the occurrence of blood in the urine.

The cases in which there was a previous history of stone have already been detailed.

In the remaining 20 cases hæmaturia was the first urinary symptom noted.

PATHOLOGY

In 28 of the total of 41 cases, microscopical examination of the tumors removed were recorded. According to these reports there were 15 cases of cancer, 10 of papilloma, 2 of sarcoma, and 1 of myoma. Under the first heading were included such varieties as infiltrating cancer, epithelioma, villous and papillary carcinoma, adeno-carcinoma, mesothelial cancer, and epidermoid cancer. Under the heading "Papilloma" were included 4 cases designated as malignant papilloma, one case as probably malignant, and 2 cases in which the question of malignancy could not be determined from the specimen. Of the 2 sarcomata, one was a round-cell variety, the other a fibro-myo-sarcoma. There were 3 cases in which secondary operations were done for recurrent tumors; in one case the recurrent growth was reported to be of the same nature as the original,—viz., cancer; in another a

papillary cancer was reported to have recurred as a papilloma, and in a third an epithelioma as a carcinoma.

To the multiplicity of terms employed by different investigators with regard to the epithelial tumors of the bladder, are to be attributed seeming discrepancies, which are more apparent than real, but which are nevertheless confusing.

How shall a malignant papilloma be distinguished from a papillary cancer, or an epithelioma from a papilloma, or carcinoma?

Recourse to the literature does not dispel this confusion, as a most varied nomenclature and classification of these growths has been adopted by different authorities. With the hope of clearing away the confusion on this subject in my own mind at least, a careful study has been made of the pathological specimens which had been preserved in 19 cases, and were kindly placed at my disposal.

Classification.—It seemed necessary at the outset to adopt a classification for these tumors. That proposed by Küster, based on histological structure, dividing tumors of the bladder into 3 groups according to the 3 elements of the bladder-wall,—epithelial, connective tissue, or muscular,—from which their principal elements are derived, is the simplest and perhaps the most generally accepted. This has been followed with one radical change in interpretation for which there is good authority, namely, the transposition of the papilloma (Zottenpolyp of Küster) from group 2 to group 1. With this change the classification stands as follows:

- | | |
|----------------------------|--|
| 1. Epithelial group | { papilloma
carcinoma
adenoma
cysts |
| 2. Connective-tissue group | { sarcoma
myxoma
fibroma
angioma |
| 3. Muscle group | { myoma |

This is essentially the classification of Albarran reduced to its simplest terms. It does not include certain rare forms of bladder tumors such as rhabdo-myoma, chondroma, and dermoids, which are not derived from any normal elements of the bladder-wall, and for which Albarran makes another class under the name "Heterotopic." As none of these rare forms was observed they are mentioned only to be dismissed from further consideration.

Papilloma.—The term "papilloma" has been retained in this classification, objections on the score of ambiguity of the word being outweighed by the sanction of long usage in English medical literature. The term as here used refers to a pedunculated papillary or villous tumor consisting of a branching connective-tissue stalk, containing blood-vessels and occasionally smooth muscle-fibres, covered with one or more layers of epithelial cells, but without epithelial infiltration of the bladder-wall. This tumor is classed under the first or epithelial group, as the epithelial element in it is regarded as the essential one. There are, however, great variations in the proportions of epithelium and connective tissue in different specimens. All gradations occur from the tumor in which the connective tissue forms a thick and massive stalk with but a thin covering of two or three layers of epithelial cells, a form which is hardly to be differentiated from the pure fibroma, to that in which the connective tissue is reduced to a mere line threading its way brokenly between masses of epithelial cells packed in countless layers.

Yet in the main two types of papilloma stand out as fairly distinct, the villous and the lobulated. The villous type, "fimbriated papilloma" of Sir Henry Thompson, is characterized by the delicacy and tenuity of its connective-tissue processes, which spring like a tuft of grass from a circumscribed base. The structure of the tumor is so delicate that it collapses into a soft mass when exposed to the air, and it is only when observed in a fluid medium that its slender filamentous nature is appreciated. Microscopically the epithelial covering is

usually comparatively thin, comprising but a few layers of cylindrical cells. By some observers this variety is regarded as merely an early stage in the development of the second type, the lobulated papilloma, "fibro-papilloma," of Thompson. In the lobulated papilloma the connective-tissue stalk is thicker and more branching, and the epithelial covering also, as a rule, considerably thicker, so that the tumor has a firmer consistency and retains its shape when removed, resembling closely a miniature cauliflower.

There may also be marked divergence from the normal type on the part of the epithelial cells in these tumors, as to size, shape, and arrangement, so that some of these papillomata may present most atypical or malignant aspects, so-called transitional forms, which are only to be differentiated from the true carcinoma by the absence of epithelial invasion of the bladder-wall.

There being then such variations in the structure of this form of tumor, it is but natural that there should have been much confusion as to its terminology and classification. The terms, "fungus" of early authors, "zottenkrebs" of Rokitsansky, "Fibroma papillare" of Virchow, "papillary epithelioma" of Zeigler, "zottenpolyp" of Küster, "fimbriated" and "fibro-papilloma" of Thompson, and "villous tumor" of many writers, all refer to this same growth, and illustrate well enough the different points of view from which it has been regarded. Nitze, though retaining the term papilloma, follows Virchow and Küster in classifying it as a connective-tissue tumor.

Carcinoma.—There is corresponding confusion on the subject of primary carcinoma of the bladder, particularly in regard to that form commonly called papillary or villous carcinoma, which is generally conceded to be the most prevalent variety. There has been and still is great divergence of opinion among authorities as to what constitutes a papillary carcinoma of the bladder. Rokitsansky held that all papillary epithelial tumors of the bladder were malignant, and designated

them as zottenkrebs. This view is still held to a certain extent. Virchow was the first to emphasize the fact that benign "papillary fibromas" did occur. The existence of benign epithelial tumors of the bladder has been amply confirmed since.

Albarran distinguishes two forms of epithelial tumors of the bladder according to the type of their epithelial coverings,—the benign papillomata, or (as he prefers to call them) "polyps bénins," and the malignant epitheliomata. If the type of the normal epithelial cells of the bladder is reproduced, then the tumor is a papilloma; if the cells are, on the other hand, atypical, then the growth is an epithelioma.

Other authorities, notably Orth and Ziegler, make epithelial infiltration of the bladder-wall, and the formation of metastases, the distinctive sign of a carcinoma in this locality as elsewhere.

The fact, which is pretty generally recognized, that a benign papilloma may undergo carcinomatous degeneration, makes it evident that there must be a stage in this process when it will be exceedingly difficult, if not impossible, to determine whether a growth is benign or malignant; the term "transitional" has been applied in such cases. This tendency of papillomata to malignant degeneration will be considered in more detail later.

It is also a generally-conceded fact that of two tumors which are otherwise macroscopically and microscopically indistinguishable, the bladder-wall may show epithelial infiltration in one, and not in the other.

Under these circumstances it seems requisite for the sake of clearness and uniformity in differentiating these papillary growths, that the condition of the underlying bladder-wall in regard to epithelial infiltration should be made the crucial test of malignancy, rather than the character and arrangement of the cells in the growth itself. The former criterion is definite and precise, and even if its application is not possible in all cases of operative removal of the tumors, is, nevertheless, to be preferred to one which, although possessing a wider range

of application, is so indefinite and subtle, and subject to such latitude of personal interpretation, as to surely lead to differences of opinion.

Other forms of carcinoma, such as the diffuse or nodular infiltrating growths, are distinctive and offer no difficulties in recognition.

Relative Frequency of Papilloma and Carcinoma.—As the result of differences of definition among authorities, there are widely divergent views as to the relative frequency of papilloma and carcinoma.

Albarran may be quoted as an exponent of the view that malignant growths greatly predominate. He records 81 epithelial tumors of the bladder which were histologically studied by himself. Of these, 13 in which the epithelium was considered typical, were classed as papillomata, and 68 in which it was atypical, were classed as epitheliomata, without reference to the question of infiltration of the bladder-wall. The word epithelioma is here used, according to the custom in France, as indicative of malignancy.

Nitze, who upholds the contrary view, mentions 220 cases of his own which were anatomically studied. Of these 144 were papillomata, 64 carcinomata, 2 adenomata, 7 sarcomata, and 5 myxomata.

Küster was the first to point out a source of error which doubtless led many observers to consider as malignant, papillary tumors which were really benign. This was the appearance of masses of epithelial cells surrounded by a connective-tissue framework which might give at first the impression of alveolar carcinoma, but which a closer study, especially of serial sections, revealed as folds between the papillary processes, cut in such a manner as to produce this effect. Another source of error which has been pointed out by Colley is the possibility of fragments of epithelial cells broken from the delicate villi of the tumor in the process of preparing the section, becoming transposed to other portions of the section, where they may be regarded as evidences of metastases. I

have frequently observed little clumps of epithelial cells scattered about the edges of the tumor, at the base, as well as on the surface, which I have regarded as due to this cause.

With this preliminary clearing of the path, we may proceed to a consideration of the cases in hand.

Analysis of Cases.—Specimens were personally examined in 19 cases; of these 17 belonged to the epithelial group, with which this analysis is particularly concerned.

In 6 of these 17 cases there was satisfactory evidence, either microscopical or macroscopical or both, of epithelial invasion of the bladder-wall. These cases were, therefore, regarded as carcinomata.

In 7 cases the specimens allowed of a more or less complete examination of the underlying bladder-wall, which was found to be free from epithelial infiltration. These cases were, therefore regarded as papillomata.

In the 4 remaining cases the specimens did not contain any portion of the bladder-wall. So that the question of epithelial infiltration could not be determined by the microscope in them. Neither was there macroscopical evidence of infiltration at the time of operation. These cases must be considered doubtful, then, as far as this test goes. It is in such cases that the structure of the tumor itself, and particularly the type and arrangement of the epithelial cells, offer a clue of more or less value as to the benign or malignant nature of the growths. On these grounds, which have already been characterized as unsatisfactory, these 4 cases have been tentatively classed among the papillomata.

Cases of Papilloma.—The specimens in the 4 doubtful cases (Nos. XX, XXI, XXVI, XXXV) may be briefly described as follows:

CASE XX.—The specimen in this case was a papillary growth the size of a chestnut, which on section showed a pedicle, without bladder-wall, from which sprung a rather coarse, branching, vascular, connective-tissue framework, markedly infiltrated with round cells and covered by a many-layered epithelium of fairly regular type, and not excessive

thickness. The line of demarcation between epithelium and connective tissue was fairly sharp. No mitoses were observed.

CASE XXI.—The specimen, one of two similar ones removed, consisted of a papillary growth of about the same size as the preceding one, showing none of the bladder-wall. The branching connective-tissue stroma was slight and exceedingly vascular. The epithelial covering was of considerable thickness in places, and here and there were clusters of epithelial cells in a concentric arrangement forming epithelial whorls. Line of demarcation not everywhere sharp; no mitoses. (See Figs. 4 and 5.)

CASE XXVI.—The section was of a papillary growth, somewhat larger than the two preceding, showing a number of branching stalks springing separately from a common base, composed of connective tissue without muscle-fibres. The papillary processes consisted of a central branching stalk of connective tissue of some thickness, containing blood-vessels clothed with a many-layered epithelium which, for the most part, did not greatly exceed in thickness the width of the stalk. The epithelial cells were of large size and quite uniform, cylindrical at the base, becoming cuboidal at the surface, disposed in layers, 12 to 30 in number, approximately. They presented a regular and typical arrangement. Mitoses were however, strikingly numerous. The line of demarcation between epithelium and connective tissue was particularly clear cut. There was some small cell infiltration of connective tissue of base and a number of plasma cells. (Fig. 6 and 7.)

CASE XXXV.—Sections consisted of fragments of a papillary tumor the size of a pigeon's egg (Fig. 1), showing neither base nor bladder-wall. The delicate connective-tissue stroma was covered with a many-layered epithelium of very considerable thickness. The cells were of fairly large size and were so closely packed together in places as to partially obliterate the spaces between neighboring papillary processes. Occasional mitoses were observed. The line of demarcation between epithelium and connective tissue was sharp.

In the sections of all these cases there were masses of epithelial cells entirely surrounded by a connective-tissue stroma; these are all, however, susceptible of Küster's explanation. In Cases XX and XXVI there were small clumps of epithelial cells scattered about the edges of the specimens, at the base as well as at the surface; these were considered to be the result of trauma to the specimen after its removal.

It would surely be difficult to draw accurate differential conclusions as to their benign or malignant character from the histology of these specimens. Of the four, No. XXVI, except for the number of mitoses, showed the most typical epithelium.

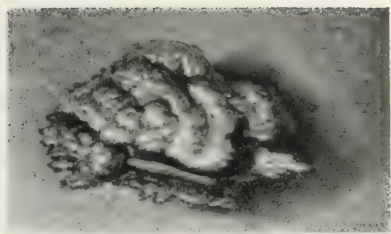


Fig. 1. Lobulated papilloma natural size (Case XXXV).

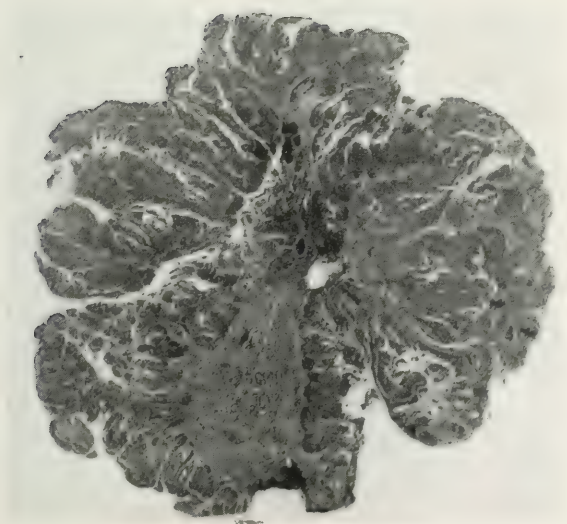


Fig. 2. Section of a lobulated papilloma $\times 4$ diameters (Case XXXVII).

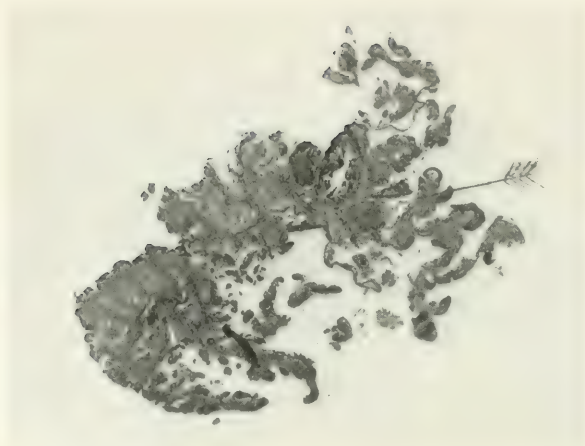


Fig. 4. Section of lobulated papilloma x 5 diameters (Case XXI). This was a recurrent growth removed 8 years ago, with no subsequent recurrence.

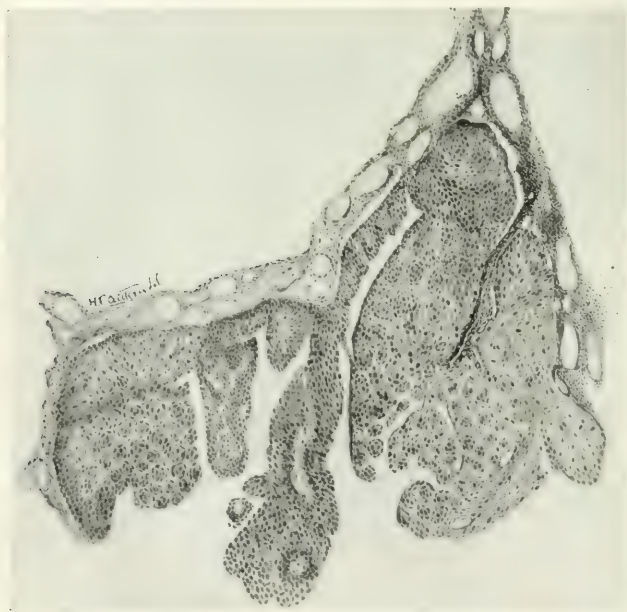


Fig. 5. Low-power drawing of detail of same at point marked by arrow. Shows vascularity of connective tissue stalk, and comparative thickness of epithelial covering, which has been drawn on one side of the stalk only. The concentric arrangement of the epithelial cells in small clusters is quite striking.



Fig. 6. Section of papillary epithelial tumor x 5 diameters (Case XXVI). In this case there was recurrence with death from the disease.

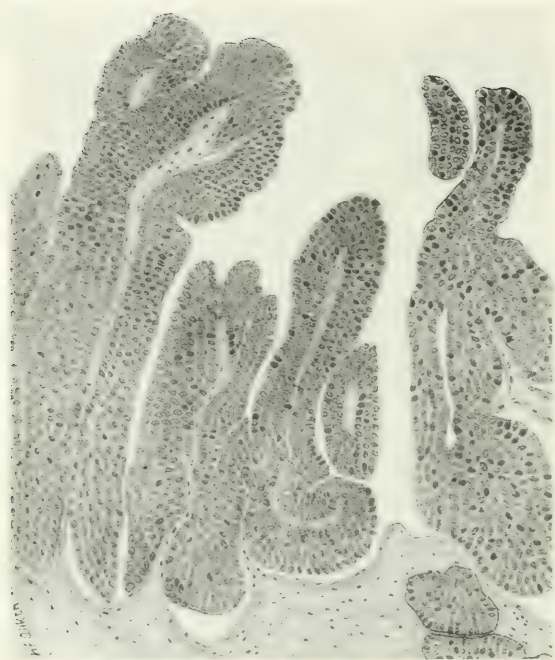


Fig. 7. Low power drawing of detail of same at point marked by arrow, showing regularity of epithelium and sharp line of demarcation between it and connective tissue stroma. The mitoses which were strikingly numerous are not shown.

What light does the clinical history of these cases after operation throw on this question?

In Case XX, eighteen months after the operation, death resulted from another disease without recurrence of bladder symptoms. In Case XXI, there have been no signs of a recurrence in the 8 years which have elapsed since the operation. In Case XXVI, there was a recurrence and a second operation, 18 months after the first, with death from the disease 2 months later. The histology of the recurrent growth will be considered under another heading. In Case XXXV, there were no bladder symptoms for 4 months after operation. No news since.*

Clinically then, one case (No. XXI) seems to have been proved benign. Another (Case XX) also probably benign. One case (No. XXVI), to be further considered later, may have been malignant from the first, but it is not necessarily so, and one (No. XXXV) still doubtful.

In 4 cases (Nos. XXIX, XXX, XXXIII, and XXXVII) the specimens removed contained portions of the bladder-wall including muscularis; careful examination of these failed to reveal evidences of epithelial infiltration in any. These specimens were of a similar nature to those already described; the first 3 of them, however, showed a greater proliferation of epithelium and a less typical arrangement, in fact a more malignant aspect, than any in the first group.

CASE XXIX.—A papillomatous tumor the size of the end of a finger was removed from the bladder with the cautery, including a margin of healthy mucous membrane and a considerable extent of bladder-wall, including the muscularis. The tumor was incrustated with urinary salts. Doubtless owing in part to the escharotic effect of the cautery, and also on account of the necessary removal of the incrustated portions, the specimen was rather imperfect and confusing. A main stalk of considerable

* This patient reëntered the hospital Feb. 5, 1906, with history of slight hæmaturia for 4 months. I did a suprapubic cystotomy and removed the prostate which was regarded as suspicious of malignant disease; there was no sign of a recurrence of the papilloma. Microspical examination of the prostate showed simple hypertrophy. The patient is now convalescing.

thickness could be made out, from which there were very fine lateral offshoots, covered with an extremely thick layer of epithelium. The epithelial cells were quite variable in size and shape, and showed in places a very irregular or atypical arrangement. There were occasional mitoses. The line of demarcation was not everywhere sharp between the epithelium and connective tissue of the stalk. There was marked round cell infiltration of the stalk. The bladder wall itself showed no epithelial infiltration.

CASE XXX.—Section of a papillary growth 2x3 cm., with a portion of the base and muscularis of bladder-wall; there were a number of long, slender connective-tissue stalks covered with an exceedingly thick layer of epithelial cells. The villous processes in places were fused. The arrangement of the epithelial cells varied considerably in different parts of the growth, being in places quite typical, in others quite atypical. A number of mitoses were observed. The line of demarcation was not sharp; no epithelial infiltration of bladder-wall. There was an opportunity to examine the bladder two days later at autopsy in this case. A partial prostatectomy for adenoma of the prostate had been done at the same time that the papilloma was removed. The bladder was found to contain much clotted blood, with hemorrhagic infiltration of the tissues about the bladder. On the mucosa of the posterior bladder-wall there was a small shaggy mass with a short pedicle. The bladder wall at the site of removal of papilloma showed some thickening. Microscopic examination, however, according to the autopsy report, showed no evidence of carcinoma. This section could not afterwards be positively identified. The section of the small papilloma, found at autopsy, showed a papillary excrescence not larger than a pea, which was partly denuded of epithelium. The epithelium where it existed was disposed in few layers. Lying on the connective-tissue stroma just below the surface and in places communicating with the surface, were clumps of epithelial cells, some of which contained open spaces in the centre, giving to them a glandular appearance. There was no epithelial infiltration of the bladder-wall at the base of the tumor. The section corresponded closely to what Zuckerkandl has described and pictured as cystic papilloma.

CASE XXXIII.—The specimen consisted of a pedunculated growth, 6 cm. in greatest diameter, which was removed from the bladder together with a considerable extent of underlying bladder-wall, including its muscularis. Microscopically the growth consisted of a number of long, slender stalks which were extremely vascular, radiating outwards from a circumscribed pedicle. These stalks were clothed with an epithelial covering of great thickness which consisted of large epithelial cells, varying considerably in size and arrangement.

In places the cells were packed together very closely, neighboring villi becoming fused and the papillary structure lost. In other places the arrangement was quite typical. Mitoses were rare. Line of demarcation between epithelium and connective tissue fairly sharp. There were evidences of intense inflammation of the bladder-wall, with round-cell

infiltration. Absolutely no epithelial infiltration. The specimen is very like that in Case XXX.

CASE XXXVII.—In this case two tumors were removed from the bladder, one the size of a pigeon's egg on the right margin of the trigonum, and another smaller growth, size of a large pea, on the posterior wall above trigonum.

The larger section showed a papillary tumor with its pedicle but without bladder wall. (Fig. 2.) The stalk was comparatively coarse and contained muscle-fibres. The epithelium, less thick than in many of the preceding specimens, was composed of small, strikingly uniform, cylindrical cells, sharply marked off from the connective-tissue stroma. No mitoses were observed. The smaller specimen was of the same character, showing a good portion of the bladder wall without infiltration. Serial sections were made of both these specimens, but beyond demonstrating the fact that masses of epithelial cells, apparently enclosed in a connective-tissue stroma really were a part of the surface epithelium, showed nothing.

Clinically, in Case XXIX, there is perfect health 2 years and 2 months later. Case XXX has no clinical after-history; the histological evidence of benignity of the growth, is, however, quite complete.

In Case XXXIII there is perfect health one year later. Case XXXVII is too recent to be considered.

It would be premature to draw conclusions from these histories, but it may be said that, as yet, the histological findings have not been belied by the clinical data.

In 3 cases (Nos. XXXVIII, XXXIX, XLI) the specimens were obtained at autopsy, and cut together with a portion of the bladder-wall to which they were attached. In these cases an excellent opportunity was afforded to examine the whole thickness of the bladder-wall directly below the stalk of the tumor, but here, too, careful search failed to show the slightest evidence of epithelial infiltration in the submucosa or muscularis in any of them. Serial sections were not made.

CASE XXXVIII.—This specimen was a coarsely, papillary growth, about 2 cm. x 3 cm., with a short stalk springing from the submucosa of the der-wall, containing large-sized blood-vessels. There was an intense inflammatory condition of both tumor and bladder-wall, evidenced by infiltra-

tion with leucocytes and necrosis. This considerably obscured the histology of the growth. The surface epithelium was mostly denuded; in one place only there were strips of a many-layered epithelium upon a connective-tissue stalk, forming a typical papillary process. The pedicle of the tumor, even close to its base, enclosed large masses of large variable-sized cells, some with several nuclei, which were regarded as atypical epithelial cells. There was no epithelial invasion of the bladder-wall itself.

CASE XXXIX.—The specimen was that of a villous tumor, 2x3 cm., the smaller of 2 similar growths, arising by a number of separate fine stalks from the submucosa of the bladder-wall. Viewed with a hand lens, the growth resembled a jungle of long grass. The long slender stalks, which showed but little branching, were covered with a comparatively narrow layer of cylindrical or spindle-shaped epithelial cells. Towards their ends the stalks were bare, the epithelium being stripped off and lying around loose, mostly at the bases of the stalks. Mitoses were rare. Many plasma cells were found in the connective-tissue stalks. There was no epithelial infiltration of the bladder-wall.

CASE XLI.—This specimen showed a delicate villous growth of small size, $1\frac{1}{2} \times 1\frac{1}{2}$ cm., arising from the submucosa of the bladder-wall by a bunch of separate connective-tissue stalks. These stalks were long and slender, with but few branches, and were mostly stripped of epithelium, the epithelial cells lying loose in confused masses between the bases of the villi. These cells were cylindrical and spindle-shaped and varied considerably. There was absolutely no epithelial infiltration of the bladder wall. (Fig. 3.)

Summary.—A recapitulation of this analysis of the 11 cases regarded as papillomata may be stated as follows:

Four were demonstrated by complete histological examination of the base and bladder-wall to be benign. Cases XXX, XXXVIII, XXXIX, and XLI.

Three may be considered benign as far as a histological examination of a portion of the bladder-wall goes. Cases XXIX, XXXIII, XXXVII.

Of the 4 remaining cases which were histologically doubtful, one case (No. XXI) may be reasonably considered to have been benign in the light of the subsequent clinical history; probably also Case XX. One case (No. XXVI) which recurred in a malignant form may have been such from the start, though not necessarily. One case (No. XXXV) is still doubtful.

Number, Size, Situation, and Form.—In 7 of the 11 cases

of papillomata the tumors were single; in each of the other 4 cases there were 2 tumors. There were no cases in this series with large numbers of papillomata,—papillomatosis.

The situation was not always exactly stated. The favorite site seemed to be at the base of the bladder near the ureteral openings. Where 2 tumors existed, the larger one was usually at the base of the bladder and the smaller on the posterior wall, at a point which would be in contact with the other when the viscus was empty. This was quite striking in Cases XXX and XXXVII, and seems to corroborate the theory of propagation by contact, which Albarran states is an indisputable fact.

In size the papillomata varied from one which was described in situ as being somewhat smaller than a lemon, which was the largest, to one the size of a small pea, the smallest.

As to form, there were two excellent specimens of the villous papillomata in Cases XXXIX and XLI; 6 were of the commoner, lobulated, or cauliflower type (Nos. XX, XXI, XXVI, XXXV, and XXXVII). The 3 remaining cases represented intermediate forms.

Cases of Carcinoma.—The specimens in the 6 cases regarded as carcinoma while affording sufficient histological data for a diagnosis, were not sufficient either in number or completeness to allow of a differentiation of varieties.

One specimen was obtained at autopsy, the other 5 at operations. The latter were removed piecemeal, so that they were necessarily fragmentary and incomplete. Only one of them showed the muscularis of the bladder-wall. In the other 4 specimens the question of infiltration, as far as the microscope was concerned, remained undetermined. It has been stated that infiltration of the bladder-wall is the distinctive mark of a papillary carcinoma of the bladder, and such it is in differentiating it from a papilloma; but where the structure is not of a papillary nature the diagnosis can be adequately made from the type and arrangement of the epithelium and its relation to the connective tissue, without reference to the bladder-wall.

A brief description of these specimens follows:

CASE XXIV.⁸—A sessile, friable tumor with a base the diameter of a silver dollar was removed by morcellement from the floor of the bladder. Sections of the fragments showed on the surface a few connective-tissue processes covered with epithelium, which were suggestive of a papillary structure, and a loose, columnar arrangement of epithelial cells in the connective tissue of what was regarded as the submucosa.

CASE XXVII.—The projecting portions of a hard mass, involving the base and posterior wall of the bladder, were removed by morcellement. The specimen on section showed masses of large atypical epithelial cells invading a stroma of connective tissue. No mucosa or muscularis of bladder-wall could be recognized.

CASE XXXI.—A "papillomatous" tumor of large size was removed from the anterior wall and base of the bladder. A section of a fragment of the growth showed in places an arrangement of the epithelium and connective-tissue stroma suggesting villi which had become fused; in other places the arrangement was of an alveolar structure. The cells were very large and flat, of squamous type. No part of the bladder-wall could be recognized as such, in the section. There were many cell inclusions in this specimen.

Six months later a secondary operation showed the base of the bladder completely studded with hard nodules, with considerable induration of the bladder-wall. Section of one of these nodules which was curetted off, showed solid masses of epithelial cells of smaller size than in the preceding growth, separated by fine, fibrous trabeculae.

CASE XXXII.—A portion only of a mass involving the right side of the bladder was removed. On section it showed solid masses of large epithelial cells infiltrating between the bundles of muscular fibres of the bladder-wall.

CASE XXXIV.—At operation the bladder was seen to be covered with "villous-looking nodules," which were easily separated from the bladder-wall. The latter was diffusely infiltrated and the urethral orifice was surrounded by a growth which was scraped off. Section of a fragment showed masses of small epithelial cells separated by a fine vascular connective-tissue stroma. No "villi" were to be seen, nor could any portion of the bladder-wall be identified.

CASE XL.—In this case the tumor was found at autopsy. An abstract of the report follows: In the bladder an irregularly ovoid, fairly smooth tumor, about $2\frac{3}{4}$ cm. in greatest diameter, with short pedicle, situated near the beginning of prostatic urethra, was found. The mucous membrane of the neck of the bladder and trigonum was generally beset with numerous small, whitish, nodules. The prostate was enlarged. Sections of the tumor showed groups and columns of atypical epithelial cells

⁸This case has been reported by Dr. F. B. Harrington. Boston Med. & Surg. Jour., May 29, 1902.

in places forming more or less perfect tubular structures, arranged in a dense, fibrous-tissue stroma. A section of the prostate showed increase in the interstitial connective tissue and dilatation of the tubules with atrophy of their epithelium, a few columns and masses of carcinomatous cells were present in the lymph-spaces. There were metastases in the retroperitoneal lymph-nodes. The growth was regarded as an adenocarcinoma, primary in the bladder.

Summary.—These 6 cases of carcinoma may be summed up as follows:

In Case XL, an adeno-carcinoma, which is a rare form of primary cancer of the bladder, the possibility that the original focus of disease was in the prostate cannot be positively denied.

In Case XXXII, an alveolar carcinoma, infiltrating the bladder-wall, the diagnosis is unassailable.

In Case XXIV, there was fairly satisfactory evidence of infiltration of the submucosa of the bladder-wall.

In the other 3 cases, microscopic evidence of infiltration of the bladder-wall was lacking; there was, however, macroscopic evidence of it at the time of operation. In all of the specimens the histological structure of groups of atypical epithelial cells enclosed in a connective-tissue stroma was sufficiently convincing; 2 cases (Nos. XXIV and XXXI) showed slight evidences of villi in places, sufficient to suggest papillary carcinoma.

The after-histories of these cases gives further proof of their malignancy, if any were needed.

In Case XXIV death resulted 6 months after the operation, the disease having returned with great loss of blood.

In Cases XXVII, XXXI, XXXII, and XXXIV, death from the disease resulted in from 2 weeks to 6 months after operation. In no case was there an autopsy.

Malignant Degeneration of a Benign Papilloma.—There has been much discussion upon this important subject, the weight of authority seeming to favor the possibility of such a change. Civiale first advanced the view that a benign papilloma of the bladder, called at that period fungus, might take on a cancerous change. This view is shared by Küster, Thompson,

Orth, Von Antal, Ziegler, Albarran, Zuckerkandl and many others.

On the other hand, Rauschenbusch does not believe in this transition, and Lubarsch holds that it is not proven. Nitze, in his vast experience, has never observed a case in which a tumor of the bladder, removed at a second operation, showed a different structure from the original.

The subject being of much practical importance, it seems worth while to examine briefly the evidence.

In the first place, there is the analogy of authenticated cases of papilloma of the larynx becoming cancerous. This has been shown by Semon to be much rarer than was generally believed. He collected statistics of 10,774 cases of benign tumors of the larynx, in only 5 of which did he find the evidence of carcinomatous change incontrovertible. The scarcity of these cases is explained by Wendel on the ground that papilloma of the larynx, unlike papilloma of the bladder, occurs mostly at an age when there is but slight tendency to cancer.

Secondly, clinical evidence seems to support the theory, for how else are cases to be explained, of which a number have been reported by Fenwick and others, where there have been symptoms of painless hæmaturia for 20 years or more, and at operation papillary tumors have been removed, showing but limited epithelial infiltration of their bases? It does not seem reasonable to suppose that such cases could have been malignant from the start, when symptoms have been so mild and the progress of the lesion so slow.

Thirdly, there is a considerable accumulation of histological evidence by different observers. Orth states that he has observed a bladder in which near a large, unmistakably cancerous, papillary growth, smaller papillary tumors were present, in which nothing of a cancerous nature was to be found. A large number of similar observations are recorded in the literature.

Zuckerkandl recognizes two modes of cancerous transformation of a simple papilloma. In one he describes the pro-

cess as beginning in the tumor itself. In this form the epithelial cells in places lose their regular form and arrangement; they become packed together in dense masses, numerous mitoses attest their rapid growth, and as a result of this epithelial proliferation, the line of demarcation between epithelium and stroma becomes less sharp, and in places groups of epithelial cells will be seen breaking into the connective-tissue spaces. In more advanced stages the papillary processes become fused and unrecognizable, only a sparse stroma with blood-vessels remaining of the original framework.

In the second form, the tumor itself remains anatomically benign in appearance, while deep in the underlying bladder-wall small metastatic masses of epithelial cells attest the malignancy of the growth. This form is illustrated by a reproduction of an actual specimen of a villous papilloma of extremely benign appearance, the exquisite malignancy of which is, however, shown by the presence of a small epithelial thrombus in the midst of the muscular coat of the bladder-wall. The first form of transformation is also illustrated by specimens.

Noteworthy cases similar to these have been reported by Colley, Schuchardt, Wendel, and others.

There is only one case in this series which can properly be considered under this heading:

CASE XXVI.—After $3\frac{1}{2}$ years of intermittent hæmaturia a papillary tumor was removed from the bladder by operation. This growth has already been described among the papillomata. (Figs. 6 and 7.)

There was a recurrence of symptoms and a second operation one year and six months later, with death from the disease two months after the second operation. At this second operation the bladder was found to be filled with large soft masses of cauliflower appearance, which were extirpated with cutting forceps. The largest of these masses removed was 3 cm. in diameter. The only specimen preserved showed on section 4 papillary stalks arising from a connective-tissue base. No portion of the bladder-wall could be identified. The connective-tissue stalks were comparatively narrow, quite vascular, branched freely, and were covered with a very thick layer of epithelial cells. These cells varied considerably in size, and were packed together without definite arrangement, so that in places adjoining villi appeared fused together, producing an appearance not unlike alveolar cancer. In other places the papillary structure

was quite regular. Mitoses were numerous. Everywhere the line of demarcation between epithelium and connective tissue was indistinct. The two tissues shaded insensibly into each other. Within a large blood-vessel of one of the stalks there was a group of epithelial cells; this was interpreted as an illusion, the result of the direction of the section, and not a real epithelial thrombus. Lying in the blood about the specimen both at the surface and at the edge of the connective-tissue base, there were small clumps of epithelial cells which were regarded as probably broken from the villi. There were, however, two clumps of epithelial cells which lay directly within the connective tissue of the base, not upon it, or at its edge, which could not but be regarded as evidence of infiltration. This fact, together with the macroscopic evidence of infiltration of the bladder-wall, makes it clear that the growth at the time of the second operation was a papillary carcinoma. (Fig. 8 and 9.)

This case is cited as a suggestive one; it cannot be claimed to be convincing, since the original specimen contained no bladder wall and therefore could not be proved to be benign.

SYMPTOMS AND COURSE OF THE DISEASE.

Hæmaturia is the cardinal symptom of tumor of the bladder; it is intermittent, at least at first, usually painless, except in malignant cases, unassociated with rest or motion, and unaffected by any therapeutic measure.

Of the 41 cases studied, hæmaturia was noted in 40, the only exception being Case XVIII, a myoma. In 20 cases it was the first symptom. In benign cases the bleeding may persist for years without other symptoms. The longest period noted among these cases was in No. V, in which case there had been intermittent hæmaturia for 16 years.

Sooner or later, however, a train of secondary symptoms is sure to arrive, due to infection of the urinary tract (cystitis, pyelitis, pyelo-nephritis, etc.,) or to mechanical blocking of the inflow or outflow of urine resulting in hydro or pyonephrosis or retention. The cases with symptoms of cystitis have already been enumerated. Retention was very common. Hydronephrosis was noted three times. Cases IV, XVII, and XXXVIII.

Incrustation of the tumor with urinary salts is a frequent occurrence and has already been fully considered. Necrosis



Fig. 8. Section of a fragment of recurrent papillary growth removed at second operation in (Case XXVI) $\times 5$ diameters. No bladder wall is shown.



Fig. 9. Low-power drawing of detail of same at point marked by arrow in Fig. 8. The relative increase in epithelium, and the atypical character and arrangement of the cells, also the fusion of the villous processes contrasts markedly with Fig. 7.

and ulceration are more common in malignant cases. Perforation into the intestines or peritoneal cavity may even occur. It was not noted in any of these cases.

In general the course of a malignant tumor is much the same as in a benign, only more rapid. Cancer of the bladder, however, is considered to be of comparatively slow growth, setting up metastases late. There is usually more pain than in benign cases and, after ulceration has set in, the condition of the patient becomes truly pitiable.

DIAGNOSIS.

The value of cystoscopy in making the diagnosis of this condition cannot be overestimated. Data as to the size, situation, character, and number of growths, also as to the advisability of operation can be obtained by this means only.

The method is applicable to all cases with the 3 following exceptions: (1) where the urethra is impassable to the cystoscope; (2) where the hemorrhage is profuse and persistent; (3) where the growth on account of its size or position prevents the necessary manipulation of the instrument. The first obstacle can usually be overcome by appropriate methods of dilatation, the second by appropriate irrigation, or by the selection of a favorable opportunity, and the last is very unusual.

The method was employed in nearly all the recent cases in this series, and I think it might have been used with benefit in all of them. The time-honored methods of examination in all vesical diseases, such as examination of the urine, especially for villous fragments, rectal examination, etc., are also of value in making the diagnosis, and should not of course be neglected.

PROGNOSIS.

Albarran says "En clinique, ce qu'il faut dire, c'est que toute vesicale est maligne on peut le devenir."

Every tumor of the bladder unless removed will in time certainly lead to a fatal termination, either from hemorrhage, or as the result of the secondary changes already mentioned. Alleged cures by spontaneous extrusion of the growth through

the urethra have been reported, but are too rare to substantially affect the truth of the preceding statement.

The clinical malignancy of the anatomically benign bladder-tumors could not be better illustrated than in Cases XXXIX and XLI.

CASE XXXIX.—A laborer, 60 years of age, was brought to the accident department of the hospital, December 22, 1900, with a history of having passed blood with his urine for 6 months. Three weeks ago the hæmaturia became constant. One week ago he took to his bed and has failed rapidly since.

He was profoundly anæmic, and nearly moribund when brought to the hospital. In spite of irrigations of the bladder with various styptics, the bleeding continued, and he died on the third day after entrance.

Autopsy revealed, as the source of hemorrhage, two pedunculated tumors, the larger $4 \times 5\frac{1}{2} \times 1\frac{1}{2}$ cm., about 2 cm. apart, springing from the mucosa of the bladder-wall just above the left ureteral orifice. One of these specimens was preserved and has already been described. There was no evidence either macroscopical or microscopical of epithelial infiltration of the bladder-wall.

CASE XLI.—A man fifty-five years old, entered the medical department of the hospital June 1, 1901, with the following history: An attack of hæmaturia $1\frac{1}{2}$ years ago; at this time there was some pain referred to the penis. One year later there was another severe attack. For the last three weeks he has been passing blood and clots constantly. Has had heart trouble for years.

The bleeding continued, uninfluenced by various internal remedies and he died June 7. At autopsy, atheromatous endocarditis of the mitral valves was found, and fibrous endocarditis of the tricuspid valve with hypertrophy and dilatation of the heart. The bladder contained much clotted blood and showed on its posterior wall a small villous papilloma which has already been described. (See Fig. 3.) Other organs were not remarkable.

The severity of the cardiac lesions in this case undoubtedly explains why surgery was not resorted to.

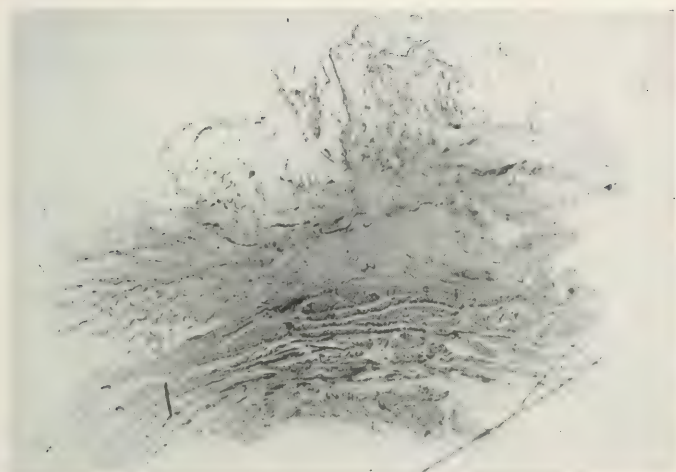


Fig. 3. Section of a villous papilloma x 6 diameters, anatomically benign, clinically malignant (Case XLI).

TREATMENT.

The only effective treatment of tumors of the bladder is operative removal. In malignant cases palliative measures may be advisable.

The treatment was operative in 37 of the cases here reported. In no case was an attempt made to radically remove an infiltrating cancer of the bladder-wall. Palliative measures, such as curettage, cauterization, and partial removal, were resorted to for symptomatic reasons in such cases.

Pedunculated tumors were removed with or without portions of the underlying bladder-wall, as the case might be.

Suprapubic cystotomy was done primarily in 28 cases, perineal cystotomy in 4, vaginal cystotomy in one; in 4 female cases the tumors were reached by dilatation of the urethra.

In 4 cases secondary suprapubic operations were done for recurrences. In one case the first operation at the hospital was for recurrence.

Results of Operation.—Of the 37 cases of all kinds, benign and malignant, favorable and unfavorable which came to operation, 9 resulted fatally within one month, or while still in the hospital, giving a mortality of slightly under 25 per cent. which can be ascribed to the operation.

Of the 28 patients who survived the operation and were discharged from the hospital, 26 have been traced; 14 (54 cent.) of these are known to have died of the disease; 12 of them died within 18 months of the operation.

In the 2 cases which survived a longer time, secondary operations were done for recurrent growths. In one of these cases, life was prolonged for 5 years after the first operation; 3 suprapubic cystotomies and severalappings of a hydronephrotic kidney having been done altogether. (Case XVII.)

Four patients (15 per cent.) have died of other diseases, without recurrence of the bladder-tumors, so far as could be learned.

In Case I, the cause of death was given as "renal calculi,"

13 years after the removal of a bladder-tumor, of which there was no microscopical report.

In Case V, cause of death was typhoid fever 9 years after the removal of a papillary epithelial growth.

In Case IX, pulmonary tuberculosis was the cause of death 3 years after the removal of a bladder-tumor, of which there was no microscopical report.

In Case XX "shock" (cerebral hemorrhage) was given as the cause of death, 1 year and 6 months after the removal of a papilloma.

Seven patients (27 per cent.) were living and well at the time this investigation was made; 2 of these (Nos. XXXVI, a case of fibro-myo-sarcoma, and XXXVII, a case of papilloma) are too recent to count. One patient (No. XIV), a case in which there was no microscopical report of the tumor, was well for ten years after the operation.

Four patients (Cases XXI, XXIX, XXXIII, and XXXV, in which the tumors were papillomata), are living and well, respectively, 8 years, 2 years, 1 year and $\frac{1}{2}$ year after the operation.

One patient (No. XVIII), a case of myoma, was in good health 2 years after the operation, but has not been heard from during the last 8 years.

It is impossible to fix upon any definite postoperative period of immunity as establishing a cure. Therefore, the word will be avoided in summing up the favorable results, which may be stated as follows:

Twelve patients (46 per cent.), including those who died of other diseases, have had no recurrence so far as known; 9 of these are known to have survived the operation one year; 7 survived the operation two years; 5 survived the operation 8 years; 3 of these dying of other diseases, leaving 2 patients (Nos. XIV and XXI), still living and well, respectively 8 and 10 years after operation.

The end results of the cases in which the histological character of the growths was personally studied, have already been incidentally mentioned.

The 5 cases of carcinoma which were operated upon, all resulted fatally within 6 months of the operation. In none of these cases was the operation radical.

Of the 8 cases of papillomata which were operated upon, there was:

One (Case XXX) in which death was the direct result of the operation.

One (Case XX) in which death resulted 18 months after the operation from another disease without recurrence.

One (Case XXVI) in which recurrence in the form of carcinoma took place, with death 2 months after a second operation.

In the other 5 cases (XXI, XXIX, XXXIII, XXXV, and XXXVII) the patients are still living and well.

Recurrence.—The cases in which recurrence occurred have already been detailed. It is the rule in cases of carcinoma and sarcoma, and common in papilloma. It is doubtful if the word can be properly applied in all cases of subsequent growths of the latter type. There are numerous instances where papillomata reappear in the bladder after removal, not at their previous sites but in other parts of the bladder-wall. In such cases there seems to be a predisposition or tendency towards the formation of papillary growths, which naturally is not affected by the mere removal of any one growth.

As a rule, rapidly and repeatedly-recurring tumors are malignant in the end if not from the beginning. *Vide* Case XVII of Table. That every recurrent papillary growth is malignant is not true, as is shown by the following case:

CASE XXI.—A man, aged 55 years, entered the hospital July 16, 1897, with the history that 7 years before he began to have more or less trouble in passing urine, with frequency at night.

There was a gradual onset of hæmaturia. Two years later he was operated on by Dr. Cabot in private, and a tumor was removed from the bladder by suprapubic cystotomy. He got along very well for three years after this, during which time it had been his custom to pass a catheter upon himself every other day. Then symptoms as before operation gradually returned. A suprapubic cystotomy was done by Dr. Cabot at the hospital. Two small pedunculated growths about the circumference of dimes were removed, and their bases cauterized. One of these was situated near the right ureteral orifice, the other to the right and behind the urethral orifice. The record stated that the latter was about on the site of the previous tumor.

The patient made an uneventful recovery and was seen by me on May 16, 1905, nearly 8 years after the second operation, when he reported his health to be excellent, without urinary symptoms of any kind. The urine was examined at this time and found to be normal in every way.

The two specimens in this case were alike. One of them has already been described. (See Figs. 4 and 5.)

CONCLUSIONS.

From this clinical and histological study of tumors of the bladder the following conclusions may be drawn:

1. Stone in the bladder is not an etiological factor of importance in the causation of these tumors.
2. The condition of the underlying bladder-wall in regard to epithelial infiltration, is the most satisfactory and reliable guide in the determination of the benign or malignant character of papillary epithelial tumors of the bladder.
3. If the foregoing condition is accepted as the differential test of these growths then will the benign forms commonly called papillomata, be found to at least equal if not outnumber the malignant, the papillary carcinomata.
4. Recurrent epithelial tumors are not necessarily malignant.

5. Papillary tumors of the bladder, proved to be histologically benign, may rapidly lead to a fatal result if let alone.

6. Surgical intervention at the proper time in the case of pedunculated papillary tumors of the bladder offers a very fair chance of long immunity, if not of permanent cure.

7. The method of surgical intervention to be preferred in these cases, is excision of the tumor in toto, with a margin of bladder-wall at its base, including mucosa, submucosa, and muscularis in part; the section need not penetrate the entire thickness of the wall. In this way, a beginning epithelial infiltration of the base if present, may be circumvented; or if it is not present, the knowledge of the fact is of great value in the important matters of diagnosis and prognosis. The defect in the bladder-wall should be closed with sutures, which will at the same time control hemorrhage. The gravity of the operation is not appreciably increased by this procedure.

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TABLE OF OPERATED CASES.

Case and Refer- ence.	Date.	Age.	Sex.	Clinical Notes.	Operation.	Operator.	Nature of Tumor.	Immediate Result.	Ultimate Result.
^I S.T.E.	Aug. 4, 1877	45	F.	Frequent and painful micturi- tion 2 years. Hematuria 2 mos. Two previous plastic opera- tions on vagina	Dilatation of urethra. Digital removal of bladder tumor	Dr. J. C. Warren	Villous growth incrust- ed with urinary salts. No microscopical re- port	Operative recovery	Died 15 yrs. later of renal calculi. (Mass. Archives)
^{II} M.R.	Nov. 1, 1883	53	M.	Hematuria 3 mos. Severe pain, pyuria, chills. Passed catul- flower-like pieces of tissue	Perineal cystostomy, villous growth removed with curette	Dr. C. B. Porter	Fragments of growth passed in urine ex- amined and reported as villous cancer. No microscopical report	Operative recovery Discharged with perineal fistula	Died 3 mos. later of cancer of bladder
^{III} W.S.P.	Jan. 8, 1885	42	M.	Painful and frequent micturi- tion. Little blood at the end of urination for 4 weeks	Perineal cystostomy, fungus growth removed with curette	Dr. C. B. Porter	Large rough tumor. No microscopical report	Died 9 days after operation. <i>Ad- dysplasia</i> cancer of bladder wall with sloughing. In- terstitial ne- phritis	
^{IV} F.G.	Dec. 21, 1885	73	F.	First noticed urine was thick and brown 8 mos. ago; 2 mos. ago hematuria began accom- panied by pain and frequency	Vaginal cystostomy, tumor the size of two English walnuts at- tached to post part of floor of bladder removed with curette	Dr. A. T. Cabot	Epithelial tumor in- crusted with urinary salts (W. F. W.)	Died 7 days after operation. <i>Ad- dysplasia</i> , gangre- nous cystitis, hy- dronephrosis and pyelitis	
^V L.J.D.	Sep. 27, 1886	34	M.	Intermittent hematuria for 16 yrs. Blood has been constant for past few mos, occasional pain, retention twice	Supra pubic cystostomy, white cretaeous growth scraped from bladder with curette	Dr. C. B. Porter	Exam. of fragments passed in urine after sounding showed the growth to be of a papillary epithelial nature. No microscop- ical report of the tumor itself	Operative recovery	Died 9 yrs. later of typhoid fever. (Mass. Archives)
^{VI} J.J.R.	Sep. 28, 1887	59	M.	Intermittent hematuria for 16 mos. Pain in lower abdomen	Supra pubic cystostomy, sessile tumor removed, base cauter- ized.	Dr. M. H. Richardson	No microscopical report	Died in 6 days. <i>Autopsy</i> showed diphtheritic cysti- tis and cellulitis	
^{VII} J.C.	April 19, 1889	52	M.	No venereal history. Symptoms of cystitis for 9 mos., blood in urinary sediment	Supra pubic cystostomy, bladder tumor curetted out	Dr. J. Homans	Friable new growth largely filling bladder. Microscopical report, <i>Epithelioma</i> (W. F. W.)	Died in 7 days. No autopsy	

viii A.W.	Nov. 19, 1889	50	M.	No venereal history. Dull pain in loin, intermittent hæmaturia beginning 10 months ago following a fall, occasional retention from clots. Hæmaturia constant for 4 wks.	Supra pubic cystostomy, small tumor near rt. urethral orifice curetted out	Dr. C. B. Porter	No microscopical report	Operative recovery	Died of carcinoma of bladder 1 yr. and 5 mos. after operation
ix M.M.	Jan. 9, 1890	29	F.	Symptoms of cystitis following confinement 9 mos. previous. Hæmaturia for 8 mos.	Dilatation of urethra, tumor size of walnut at base of bladder curetted out	Dr. J. W. Elliot	No microscopical report	Operative recovery	Died 13 yrs. later of tuberculosis of lungs (Mass. Archives)
x A.E.S.	Jan. 14, 1892	51	F.	For 2 years has had urethral discharge, at times blood stained; 5 wks. ago portion of growth removed from urethra. Symptomatics, frequency, pain and tenesmus	Growth involving urethra and ant. wall of vagina curetted, urethra dilated and papillomatous tumor of bladder curetted out	Dr. C. B. Porter	Microscopical report, <i>Infiltrating cancer</i> (W. F. W.)	Operative recovery	Died 8 mos. later of cancer of bladder
xi S.C.W.	Jan. 18, 1892	55	M.	No venereal; 20 yrs. ago had slight trouble in passing water for a few mos., no further trouble until 1 yr. ago when he first noticed clots of blood in urine. Intermittent hæmaturia since. Retention from clots	Perineal cystostomy, large papillomatous tumor attached to base of bladder removed with stone forceps	Dr. A. T. Cabot	No microscopical report	Operative recovery. Developed insanity during convalescence	Died 1 yr. later with recurrence
xii E.S.	May 13, 1892	65	M.	Hæmaturia for 5 mos. Pain and frequency followed. Lost 50 lbs. in weight	Perineal cystostomy, tumor size of walnut curetted off bladder wall	Dr. J. Homans	No microscopical report	Operative recovery	Further history unknown
xiii J.G.	July 12, 1892	54	M.	Gonorrhœa 35 yrs. ago. Symptoms of cystitis began 8 wks. ago, 6 weeks ago began to pass blood.	Supra pubic cystostomy, tumor removed with curette, tumor was size of baby's hand above the urethral orifice	Dr. A. T. Cabot	Microscopical report, <i>Cancer</i> (W. F. W.)	Operative recovery	Died 3 mos. later with recurrence
xiv J.H.	July 10, 1894	34	M.	Gonorrhœa 15 yrs. ago. Hæmaturia began 2 mos. ago following a fall. Constant bearing down pain	Supra pubic cystostomy, hard and dense tumor 2 in. by 1½ in., on floor of bladder removed with chain écarteur	Dr. S. J. Mixer	No microscopical report	Operative recovery	In perfect health Feb., 1905. Personally examined
xv J.E.B.	July 19, 1894	46	M.	In 1870 lateral perineal lithotomy. Frequency of micturition ever since. In 1889 supra pubic cystostomy by Dr. Cabot at M. G. H. "Pachydermia vesicæ." Re-enters hospital with a broken-down supra pubic sinus and symptoms of severe cystitis with hæmaturia	Supra pubic sinus dilated, bladder explored, portion of a new growth removed with forceps	Dr. A. T. Cabot	Microscopical report, <i>Glandular cancer</i> (W. F. W.)	Gradually failed after operation. Autopsy showed cancer involving bladder wall, abdominal wall and retro-peritoneal glands	

TABLE OF OPERATED CASES—Continued.

Case	Date.	Age.	Sex.	Clinical Notes.	Operation.	Operator.	Nature of Tumor.	Immediate Result.	Ultimate Result.
xvi G.C.F.	Dec. 22, 1894	61	M.	No venereal. Frequency for 7 mos. Hamaturia 8 wks. Occasional stoppage. Pain for last 2 wks.	Supra pubic cystotomy, growth curetted from int. urethral orifice	Dr. C. B. Porter	Fragments obtained by washing bladder reported as papilloma. Microscopical report of masses removed at operation, <i>Cancer</i> , (W. F. W.)	Died 2 weeks later. No autopsy	
xvii * S.H.T.	Jan. 9, 1895	53	M.	No venereal. Frequency of micturition with scalding began 6 yrs. ago. Hamaturia 1 year ago	No. 1—Supra pubic cystotomy, tumor size of Mandarin orange removed piecemeal from post. wall	Dr. S. J. Mixter	No microscopical report	Operative recovery	The hydronephrotic kidney refilled and was tapped several times subsequently. In March 1901, sound could not be made to enter bladder, which seemed filled with new growth. Patient died of the disease a few mos. later
	Re-entry, April 30, 1896			Relieved by operation for 1 yr. then hamaturia recurred	No. 2—Supra pubic cystotomy, tumor size of orange on ant. wall removed with scissors and base cauterized		Microscopical report, cancer with slight infiltration of bladder wall (W. F. W.)	Operative recovery	
	Re-entry, June 23, 1897			Pain and hamaturia recurred in 6 mos.	No. 3—Supra pubic cystotomy, papillomatous growth size of plum projecting from lower post. wall of bladder removed with curette		Microscopical report, Papillary cancer (W. F. W.)	Operative recovery	
	Re-entry, April 24, 1900			Pain and pressure in left side	No. 4—Cystic tumor in left hypochondrium tapped, 3 cwt brownish fluid evacuated	"	.....	Temporary relief	
xviii M.V.B.M.	Nov. 12, 1895	57	M.	Stricture of urethra 15 yrs. ago; .9 yrs. ago renal colic, later passed some small stones, 1 yr. ago symptoms of cystitis began. In Feb., '95, litholapaxy at M. G. H. and again in August by Dr. Cabot in private. In Sept. a stone was washed out of bladder. In Nov. same symptoms recurred and he re-entered hospital	Supra pubic cystotomy, stone removed from post. prostatic pouch, two small hard projections incruited with urinary salts removed from bladder wall	Dr. A. T. Cabot	Microscopical report, Myoma (W. F. W.)	Operative recovery	In good health 2 years after operation. Not heard from since

* This case has been reported by Dr. Mixter. Boston Medical and Surgical Journal, April 20, 1899.

xxix C.S.	Feb. 22, 1896	70	M.	No venereal. Pain and frequency 2 yrs, hæmaturia 8 months	Supra pubic cystostomy, large sessile tumor on right side of bladder curetted out	Dr. A. T. Cabot	Microscopical report, <i>Fiatcell cancer</i> (W. F. W.)	Died in hospital 4 mos. later. Incomplete autopsy showed bladder extensively involved in growth	
xx S.B.	June 28, 1897	52	M.	Gonorrhea 30 yrs. ago. Painless hæmaturia began 1½ yrs. ago. Later pain in left testicle and kidney	Supra pubic cystostomy, growth size of strawberry on post. wall above trigonum removed, base curetted	Dr. S. J. Mixter	Microscopical report, Papilloma. Impossible to say whether malignant or not (J. H. W.)	Operative recovery	Died 1 year and 6 months later of shock (cerebral hemorrhage) without recurrence of bladder symptoms
xxi E.S.	July 16, 1897	55	M.	No venereal; 7 years ago symptoms of frequency and afterwards hæmaturia began; 5 yrs. ago papilloma removed from bladder by Dr. A. T. Cabot in private; 2 yrs. ago symptoms recurred as before	Supra pubic cystostomy, two small tumors removed with forceps and their bases cauterized, one was situated to the outer side of the rt. ureteral orifice, the other behind ureteral orifice about on the site of the previous tumor	Dr. A. T. Cabot	Microscopical report, <i>Papilloma</i> . Impossible to say whether or not malignant (J. H. W.)	Operative recovery	Personally examined in May, 1905, nearly 8 yrs. after second operation. Health perfect
xxii H.A.T.	Sep. 26, 1899	63	M.	No venereal. Frequency and hæmaturia for 6 mos. Occasional retention	Supra pubic cystostomy, growth on rt. side of bladder extending toward prostate curetted out, base cauterized	Dr. J. C. Warren	Microscopical report, <i>Cancer</i> (W. F. W.).	Operative recovery	Died 2 mos. later of recurrence
xxiii N.K.	May 13, 1900	26	F.	Symptoms of cystitis with hæmaturia for 2 yrs. following confinement. Passed several stones	No. 1—Dilatation of urethra, two small tumors, one on post. wall, one on left side, removed, bases curetted	Dr. J. W. Elliot	No microscopical report	Operative recovery	
	Re-entry, Dec. 1, 1900			Painful and bloody urination, returned soon after leaving hospital.	No. 2—Supra pubic cystostomy, deposit of calcareous matter on bladder wall curetted off, two small papillomatous masses removed	Dr. R. B. Greenough	No microscopical report	Operative recovery	Subsequent history unknown
xxiv J.P.K.	Aug. 20, 1900	49	M.	Hæmaturia began 10 wks. ago. Pain and frequency began soon after	Supra pubic cystostomy, sessile friable tumor with base size of silver dollar removed from base of bladder with prostate	Dr. F. B. Harrington	Microscopical report, <i>Pillolar Carcinoma</i> (J. H. W.)	Operative recovery	Died in another hospital with recurrence 1 yr. and 6 mos. later
xxv L.V.	Oct. 20, 1900	69	M.	No venereal. Pain, frequency and hæmaturia began about 6 mos. ago	Supra pubic cystostomy, a soft sloughing pedunculated tumor at neck of bladder removed with curette	Dr. J. C. Warren	No microscopical report	Operative recovery	Died 3 mos. later of cancer of bladder

TABLE OF OPERATED CASES—Continued.

Case Refer- ence.	Date.	Age.	Sex.	Clinical Notes.	Operation.	Operator.	Nature of Tumor.	Immediate Result.	Ultimate Result.
xxvi F.H.D.	Dec. 31, 1900	58	M.	Gonorrhea 38 yrs. ago. Hæma- turia began 1 yr. and 3 mos. ago. Intermittent since. Fre- quency during last month; 3 attacks of retention	Supra pubic cystotomy, soft papillary mass on left side of bladder removed with forceps, base cauterized	Dr. A. T. Cabot	Microscopical report, <i>Papillary cancer</i> (W. F. W.)	Operative recovery	
Re-entry, July 2, 1902				Blood re-appeared in urine 6 months after operation and continued with frequency and tenesmus	Supra pubic cystotomy, bladder filled with large soft cauliflower mass which was removed piece- meal with forceps	"	Microscopical report, <i>Papilloma</i> (C. C. S.).	Discharged from hospital with per- manent bladder drainage	Died 2 mos. later of the disease
xxvii F.L.	June 6, 1901	53	F.	Frequency 10 mos. Hæmaturia 8 mos. Pain	Supra pubic cystotomy, hard irregular mass involving base and post. wall of bladder, pro- jecting portions of growth re- moved, everted and cauter- ized	Dr. F. B. Harrington	Microscopical report, <i>Mesothelial cancer</i> (W. F. W.)	Operative recovery	Died 6 mos. later of the disease
xxviii S.S.	Mar. 11, 1903	58	M.	No venereal. Hæmaturia 10 mos. Pain in left back. Fre- quency of micturition for 6 months	Supra pubic cystotomy, a mass projecting into the right side of the bladder removed with pros- tatic forceps, the growth also extended into pelvis, no at- tempt was made to remove it	Dr. A. T. Cabot	Microscopical report, <i>Round cell sarcoma</i> (W. F. W.)	Discharged from hospital with per- manent supra pubic drainage	Died 2 mos. later of the disease
xxix T.A.B.	Mar. 17, 1903	59	M.	No venereal. Hæmaturia 3 months.	Supra pubic cystotomy, papil- lomatous growth to the left of prostate removed with a mar- gin of normal mucus mem- brane with cautery	Dr. A. T. Cabot	Tumor size of end of finger incruusted with urinary salts. Micro- scopical report, Malignant Papilloma. No evidence of infiltration of bladder wall (W. F. W.)	Operative recovery	Letter of May, 1905, reports perfect health. No urinary symptoms of any kind
xxx W.H.	July 8, 1903	57	M.	No venereal. Intermittent hæ- maturia for 4 yrs. Slight pain and frequency	Supra pubic cystotomy, papil- lomatous tumor size of egg re- moved from ant. wall on left, bladder wall sutured, 3d lobe of prostate found enlarged and removed with prostatectomy	Dr. W. M. Conant	Microscopical report, <i>Papilloma, probably malignant</i> (C. C. S.) Adenoma of prostate.	Died in 24 hours, <i>Autopsy</i> showed hemorrhage into bladder; on post. wall of bladder small papilloma found; examina- tion of bladder wall showed no epithelial infiltra- tion	

xxxix N.W.	Jan. 31, 1904	40	M.	Operated on for stone in the bladder at the age of 9. No further urinary symptoms until hæmaturia began 2½ yrs. ago. Intermittent pain at first, then old symptoms returned.	No. 1.—Supra pubic cystostomy. papillomatous tumor at base of ant. wall of bladder removed with prostatic forceps	Dr. A. T. Cabot	Microscopical report, <i>Epithelioma</i> (W. F. W.)	Operative recovery	
Reentry, Aug. 1, 1904					No. 2.—Supra pubic cystostomy; base of bladder studded with hard nodules, considerable induration of bladder wall, nodules removed with curette and cautery.	Dr. W. M. Conant	Microscopical report, <i>Carcinoma</i> (C. C. S.).	Operative recovery	Died of the disease 2 mos. later
xxxii E.B.	Mar. 14, 1904	58	M.	No venereal; 1 yr. ago passed gravel, 6 weeks ago retention; 3 weeks ago pain and bleeding began.	Supra pubic cystostomy, mass involving left side of bladder, portion of growth removed	Dr. M. H. Richardson	Microscopical report, cancer	Operative recovery	Died 3 mos. later of the disease
xxxiii S.S.R.	May 10, 1904	63	F.	Intermittent painless hæmaturia for 2½ yrs.	Supra pubic cystostomy, pedunculated papillary growth size of lemon on post. wall of bladder excised at base, defect in bladder wall sutured	Dr. J. W. Elliot	Growth 6 cm. diam., pedicle 1 cm. Microscopical report, <i>Malignant papilloma</i> . No evidence of infiltration of bladder wall. (W. F. W.)	Operative recovery	Letter of May, 1905, reports perfect health. No urinary symptoms
xxxiv E.B.	June 2, 1904	57	M.	Frequency 8 mos. Pain in back and hæmaturia 1 mo. Retention	Supra pubic cystostomy, bladder mu. covered with villous nodules, urethral orifice surrounded by a growth which was scraped off	Dr. S. J. Mixer	Nodular fragments from the bladder, the wall of which was diffusely infiltrated with a new growth. Microscopical exam., <i>Cancer</i> (W. F. W.)	Died in 2 weeks; septic absorption. No autopsy	
xxxv A.M.	Dec. 20, 1904	58	M.	No venereal. Hæmaturia began 2 yrs. ago with constant dull pain in flank. Frequency occurred later	Supra pubic cystostomy, pedunculated tumor size of strawberry just above rt. urethral orifice removed with scissors, with small margin of mucous membrane, site of tumor cauterized	Dr. L. Davis	Coarsely papillary tumor size of horse chestnut. Microscopical exam., <i>Malignant papilloma</i> (W. F. W.)	Operative recovery	Supra pubic prostatectomy Feb. 17, 1906. No recurrence
xxxvi M.S.	April 27, 1905	16	M.	19 mos. ago hæmaturia began accompanied by great pain. Frequency of micturition later developed with nocturnal incontinence	Supra pubic cystostomy, a firm tumor size of orange arising by a thick short pedicle from the right side of internal meatus removed en morcellement, leaving a thick, ragged base which was cauterized, lower portion of tumor was incrustated with urinary salts	Dr. F. G. Balch	Microscopical report, <i>Fibro-myo-sarcoma</i> (W. F. W.)	Operative recovery Discharged July 2 with small supra pubic fistula	Case too recent for data
xxxviii M. J. C.	Sep. 16, 1905	51	M.	Gonorrhea many years ago; 2 years ago began to pass bloody urine without pain; 2 wks. ago retention	Supra pubic cystostomy, larger tumor removed from right edge of trigonum with scissors, site of tumor cauterized, smaller one on post. wall of bladder removed with a good margin. defect in bladder wall sutured	Dr. J. G. Mumford	Microscopical report, <i>Malignant papilloma</i> (W. F. W.)	Operative recovery Discharged from hospital Nov. 4, 1905, with granulating wound above pubes	Case too recent for data

TABLE OF UNOPERATED CASES OF TUMOR OF THE BLADDER FOUND AT AUTOPSY.

No.	Date	Age	Sex	Clinical Notes	Post-mortem Findings
xxxviii Autopsy 87	April 15, 1897	70	Male	No venereal. Two years ago passed gravel. Five months ago began to have frequency of micturition. Haematuria began one month later and has been constant since, with much pain. Operation was deemed inadvisable on account of poor general condition. Patient slowly failed and died April 23, 1897.	"Papilloma of Bladder. Diphtheritic cystitis. Inflammatory infiltration of peri-vesical tissues. St. pyelo-nephrosis of left kidney. St. hydro-nephrosis of right kidney. Acute peritonitis. Acute degeneration of kidney. Infarction of kidney. Arterio-sclerosis with cardiac hypertrophy and dilatation. Emphysema. Hypostatic congestion and œdema of lungs."
xxxix Autopsy 641	Dec. 22, 1900	60	Male	Brought to accident room in extremely weak and anemic condition with history of having passed bloody urine for 6 months. Failed rapidly during last 3 weeks. In spite of washing the bladder with various styptic solutions, the hemorrhage continued and the patient died in 3 days.	"Papillomata of the bladder. Hemorrhage into bladder. General anaemia. Fatty degeneration of heart muscle. Concentric hypertrophy and dilatation of heart. Arterio-sclerosis of aorta and coronary arteries. Chronic atheromatous endocarditis of mitral valve with acute vegetations. Gœdema of lungs. Cholelithiasis. Hyperplasia of spleen. Cysts of right kidney. Right hydrocele."
xl Autopsy 681	Feb. 25, 1901	64	Male	No venereal. Severe attacks of pain in region of left kidney for 20 years. Haematuria during last 2 months. An exploratory nephrotomy was done with negative result, and the bladder searched for stone without result. Patient died 4 days later with partial suppression of urine.	"Nephrotomy with hemorrhage into peri-nephric and retroperitoneal tissues. Adenocarcinoma of the neck of the bladder with metastasis in the retroperitoneal lymphatic glands. Senile degeneration of the kidneys. Adenoma of the prostate. Chronic interstitial prostatitis. Chronic pericholecystitis and perihepatitis. Gœdema of lungs. Ecchymoses in the mucous membrane of the stomach. Defective closure of the foramen ovale of heart."
xli Autopsy 710	June 8, 1901	55	Male	Heart trouble since childhood. Painless hematuria began 1½ years ago. For 3 weeks the bleeding was constant. Bleeding continued while in the hospital, with death at the end of a week. (Operation not undertaken presumably on account of heart.)	"Papilloma of Bladder with hemorrhage. General anaemia. Atheromatous endocarditis of the mitral and aortic valves. Fibrous endocarditis of the tricuspid valve. Hypertrophy and dilatation of the heart. Concretions in the prostate."

ISCHEMIC MUSCULAR ATROPHY, CONTRACTURES AND PARALYSIS.*

BY ALEXANDER HUGH FERGUSON, M.D., C.M.,

OF CHICAGO, ILL.,

Professor of Clinical Surgery in the University of Illinois.

ISCHEMIC atrophy and paralysis, being the changes which occur in muscles from which the blood-supply is more or less cut off, may be due to the following causes:

I. *Arterial*—depending on two causes: (a) Interruption must be nearly complete; (b) interruption must be of more than two of three hours' duration, otherwise it is easily tolerated—sometimes incomplete interruption for several days.

II. *An interrupted venous return*.—Causes: 1. Embolus—cardiac; 2. Thrombus—syphilitic endarteritis, or following acute infectious diseases; 3. Raynaud's disease—changes in vessels due to defective nerve innervation; 4. Direct injury to a vessel; 5. Cold; 6. Most common of all—tight splinting, to which I shall mostly refer.

Symptoms.—Paresthesia—numbness and tingling in parts of limb affected, and perhaps combined with alternating sensations. Severe and often paroxysmal pain in muscles followed by cramps and spasmodic jerkings. Limb often pale, but sometimes cyanosed and cold. Electric irritability of muscle lost after ischemic condition has lasted five hours, and the muscles are quite flaccid and powerless, as seen in operations after prolonged use of Esmarch's bandage. After seven hours, muscular rigidity and painful contractures begin. These increase in severity, but disappear in two or three days, leaving muscle again flaccid. Edematous condition from more or less established collateral circulation. Muscles now tender on press-

* Read before the Chicago Surgical Society, December 1, 1905.

ure. Swelling gradually disappears; muscular atrophy becomes manifest, muscles being hard and firm.

Contractures follow—hand flexed at wrist, and fingers at phalangeal joint. Final contractures due to atrophy of muscles and overgrowth of fibrous connective tissue. Atrophic changes in the skin often present.

Course.—This depends on the duration of the primary ischemic condition. When cramps and rigidity have set in, probably no immediate recovery of the muscle is to be looked for, but short of this the muscles may readily recover, if the blood supply is restored. In cases where cramps have appeared, it is probable that many of the muscular fibres die, and have to be replaced by regeneration—a long and slow process, or by repair. When ischemia is of greater duration, and the muscles have become flaccid, it is not probable that any great amount of restitution can occur. However, certain fibres may have escaped, and from these new fibres may be formed, but the amount of recovery will be small. In such cases the muscles rapidly atrophy, becoming tough, hard and contracted.

Pathological Anatomy.—A. If blood supply is completely interrupted. B. If blood supply is partly interrupted.

A.—1. Muscle is gray, dirty yellow color, dull in appearance, and friable.

2. Under microscope—transverse and longitudinal structures more obvious.

3. Almost complete absence of muscular nuclei.

4. Usually no fatty degeneration.

B.—1. Muscle firm and tough; more or less normal in appearance.

2. Under microscope—great increase of fibrous connective tissue between bundles of muscular tissue and between individual muscle, fibres and cells.

3. Fibres have lost their polygonal form; are smaller and rounder, but maintain their striæ even under extreme atrophy.

II. *Interrupted Venous Return.*—1. Acute symptoms are

those of thrombus, viz., swelling, cyanosis, œdema; limb feels fuller, harder, and is tender on pressure.

2. Acute symptoms may pass off, but limb is left in condition of passive congestion, making limb larger—pseudo-hypertrophy.

Pathological Anatomy.—1. Early stage—increase of intermuscular fibrous connective tissue.

2. Later stage—connective tissue more abundant; some atrophy of muscles, fibres and fatty degeneration.¹

Pressure Lesions of Nerves.—1. The resultant symptoms of severe cases of this are similar to nerve section and are paralytic in nature, pain and hyperæsthesia being usually absent.

2. Paralysis usually more marked than anæsthesia.

3. Trophic changes are usually rare.²

Having now made a brief, and, I trust, concise review of the most prominent points relating to ischemia, I desire to add a short account of two recent cases of this nature, on account of their aptitude to the subject, and the surprisingly favorable results attending my operative treatment of them.

CASE I.—On the 4th day of May, 1902, a school-boy, aged nine years, and weighing 65 pounds, entered Chicago Hospital, with the following trouble:

(a) Deformity of hand. The forearm, wrist and hand were crippled, and abnormal in size, shape and color. The whole extremity below the elbow was apparently much smaller than normal, and the fingers, which looked blue and felt cold, were flexed into the palm.

(b) Fixation. The fingers were not merely flexed into the palm, as already stated, but also there fixed. No effort on his part, nor considerable force by me, could effect but the slightest

¹ Chiefly indebted for this data to F. E. Batten, M.D., F.R.C.P., London.

² Chiefly from an article by W. Thorburn, M.D., and R. T. Williamson, Manchester, England.

increased flexion or extension. Voluntary motion at the wrist, or supination, or pronation, was extremely limited. (Fig. 1.)

(c) Atrophy. The bellies of the muscles appeared to be entirely absent, except near the elbow. The skin hugged the bones; the deeper soft parts were firm, hard and immovable. The circumference of the forearm was less than that of its fellow by about one-third.

(d) Paralysis. The hand was paralyzed as to motion, although the muscles responded to irritation and electricity near the elbow at the points where they were applied. When electricity was applied to the extensor muscles of the hand, no extension ensued of either wrist or fingers. Sensation of the fingers and hand was rather increased. Sensations of heat and cold were normal.

(e) Loss of function. The hand was useless for ordinary purposes.

Although an anteoperative photograph was not successfully obtained, yet I endeavored to make good this interesting deficiency by having a postoperative picture taken of the arm placed in its original malposition. This is shown in Fig. 1.

History.—Four years previously the patient had both bones of right forearm broken at the middle, which, when set, was put up with fingers flexed and bandages tight. When the splints were removed, seven weeks afterwards, and the condition of the limb discovered, he was brought to an eminent Chicago surgeon, who stretched the fingers, giving some improvement, but no cure.

Operation.—An Esmarch bandage was applied in proper manner for the case. A long curved incision was made on flexor surface of forearm. All the muscles and tendons were found matted together by fibrous tissue. These were separated from each other, and the ulnar and median nerves were disengaged and stretched. Muscle-tendon splicing was done on all the flexors, in order that the lengthened tendons would permit of the extension of the fingers. The cavity of the wound was filled with sterilized olive oil around the tendons and nerves. Capillary drainage inserted; wound closed, and hand placed in hyper-extended position; held there by splints.

The operation consumed an hour and five minutes, under chloroform. The patient behaved well and reacted properly.



FIG. 1.—Deformity in Case No. 1. Since I failed to secure a good photograph of the arm previous to operation, and not wishing to be without a picture of the arm in its pre-operative position, I had it again taken after the operation in its original mal-position. This figure shows it quite well.

Upon exposing the muscles and tendons their small size was very obvious. In carrying out their isolation some difficulty was experienced in identifying one tendon from the adjacent one. The knife was constantly in use. Cleavage was impossible in the middle of the forearm, for here all semblance of tendon sheaths was gone. The tendons appeared longer than normal, and seemed to encroach upon the muscle substance. On account of the pressure atrophy the muscles were small, firm and fibrous to a marked degree. The musculo-tendon splicing being completed, the hand and fingers placed in a hyper-extended position, I could not but remark upon the long and insignificant-looking threads, and express a very doubtful prognosis. The return of arterial blood into the parts after removing the rubber bandage did not clear away the paleness of the structures, nor my apprehension of their viability. The olive oil was used to prevent, if possible, an immediate gluing together of all the tendons again, and I feel sure of its benefit in this case, to the end desired. The median and ulnar nerves were here and there nodular, and in some places smaller than normal.

Postoperative.—On the third day he developed a temperature which on the evening of the fourth day reached 104.4° F. The wound was dressed and found all right. On the fifth day the temperature was down, but again rose rapidly. He had tympany and extreme tenderness in right iliac and hypogastric regions; leucocytes 30,000; also some diarrhoea. The area was again dressed and found in perfect order. He was then operated upon for appendicitis (acute obstructive variety), and that member was found inflamed, enlarged and obstructed. After operation, pain abated and temperature was lower for a few days, but on the fourth day following this last operation pyrexia and its concomitant symptoms returned, and continued more or less for two weeks, but not alarming. Widal reaction and diazo-reaction tests were both negative, and no abdominal spots appeared, although there were diarrhoea and tympanites. Liquid diet was substituted, and quinine sulphate, gr. iii, every four hours, and hydrargyrum cum creta, gr. ii, every night, administered. By the twenty-third day the patient was sufficiently recovered to return to his home. During his stay in the hospital his arm was dressed frequently and under passive motion slowly improved. The wound healed by

first intention. The fingers could then be easily straightened passively, and almost to a complete degree voluntarily. He could hold his fingers completely shut passively and had considerable flexor power. See Figs. 2, 3, and 4.

The following is the last report (November 28, 1905): "He can straighten the fingers and can close them slightly only. He can hold the hand shut by using the thumb after he has shut it with the other hand. He uses the hand to write and do his school-work, but we do not think he has got as much use of it as you expected; still we think it is gaining all the time." (Figs. 6 and 7.)

CASE II.—Mary H., aged 12 years, weight 80 pounds. Entered Chicago Hospital, November 5, 1904, with the following history, in part, viz.: Ten weeks previously the left humerus was fractured at the junction of the lower and middle thirds. The fragments were soon placed in apposition, and tight splints were bandaged on the entire arm and forearm, and left in this position for seven weeks.

Examination revealed a scar, one-half inch wide and three inches long, extending from the front around to the posterior surface of the arm, three inches above the left elbow joint (Fig. 7). The elbow joint was stiff and tender, and even moderate flexion was impossible. There was a deformity at the wrist and hand, consisting of marked flexion. The proximal phalanges were fully extended, and the two distal segments of the phalanges completely flexed. The forearm showed great atrophy, this being more marked in the region of the flexor bellies. She was unable of herself to adjust this malposition, and any attempt to correct it by forcible manipulation was not only painful, but entirely devoid of even temporary improvement, giving marked evidence of the matting together of the structures of the forearm. Sensations of heat and cold, muscular sense, and tactile sense were lost, except in the index and little fingers, and here they were imperfect and slow.

The hand was colder than its fellow, in all probability showing vasomotor interference.

Operation.—Having applied an Esmarch bandage, an incision was made along the inner border of the biceps for the purpose of exposing the seat of fracture of the humerus and liberating any



FIG. 2.—Showing the extreme limit of voluntary flexion of wrist after operation in case 1.



FIG. 3.—Showing limit of voluntary extension of fingers after operation in case 1.



FIG. 4.—Showing limit of voluntary flexion of fingers after operation in case 1.



FIG. 5.—Case 1, November 28, 1905. Extension over three years after operation.



FIG. 6—Case 1, November 28, 1905. Flexion over three years after operation.

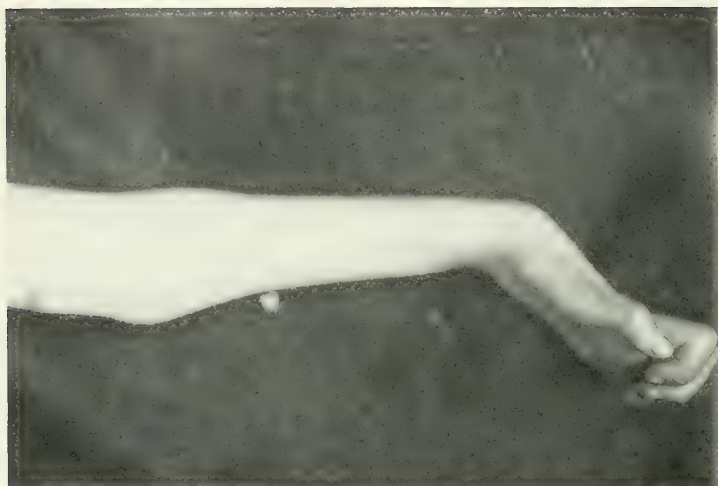


FIG. 7.—Arm before operation in case 2. 1, Transverse scar three inches long running half way around the arm three inches above elbow joint; 2, Atrophy of flexor bellies; 3, Flexion and fixation of wrist; 4, Extension and fixation of proximal phalanges; 5, Acute flexion and fixation of two distal segments of phalanges.

osseous or connective-tissue adhesions which might have formed around the ulnar or median nerves and at the same time determine what damage, if any, had been done to those latter structures. On exposing these nerves, they were found to be normal in appearance, and the bone well united. A second incision was made along the outer surface of the arm, exposing the musculo-spiral nerve, which was thickened and bulbous. These incisions having been closed, the first incision was continued down the forearm and well into the palm. The flexor tendons, having been identified, were individually treated in the following manner: A longitudinal incision, four or five inches long, was made in each muscle and its tendon, cutting across one-half of the tendon from its continuity below, and then transversely severing the muscular portion of the other half above. These corresponding musculo-tendon halves were then temporarily united with fine catgut to maintain their identity. A similar procedure was followed on all the other flexors of the wrist and hand. They were then securely sutured in the extended position by means of three interrupted sutures in each musculo-tendinous structure. Although the wrist and hand were thus liberated, full extension was not possible until the nerves were separated from their surrounding adhesions. The median was atrophied to less than half its normal diameter, below the elbow, and the ulnar nerve showed bulbous enlargements, with atrophied intervals. The wrist and hand were now easily straightened. The skin was closed, and the forearm was drained in several places with strands of silkworm gut. Sterile olive oil was poured over the tendons. The dressings consisted of aseptic gauze next to the skin over which was placed an abundance of iodoform gauze. A plaster-of-Paris cast was then applied and the hand and fingers placed in hyperextension.

The operation was completed in one hour and fifty minutes. Anæsthetics, chloroform and ether. Pulse before operation, 70; during, 108; and after, 88. Hypodermoclysis of normal salt solution at conclusion of operation (500 c.c.).

Results.—Union of skin by first intention. Chromoform catgut No. O, not absorbed in three weeks.

Report Six Weeks Later.—1. Tenderness in elbow is fast disappearing and flexion and extension are almost complete.

2. More vital activity is gradually coming into the hand.
3. Can immediately tell which finger is touched, showing a return of sensation.
4. Can pick up a small article, like a pin, after trying for a while, showing a return of muscular sense and coördination.
5. Fingers can be straightened and flexed to a considerable extent, and this power is increasing.

It is well to point out that the fracture was of the humerus, and the tight bandaging was on the forearm; the fracture united perfectly, and no damage was done to any of the soft structures surrounding it, but where the bandages were too tightly applied, atrophy, contraction and paralysis of the soft structures ensued.

In regard to fixed state in which the nerves were found, one can readily imagine how easily they could be ruptured by forcible extension of the fingers under an anæsthetic, and irreparable damage done.

The last report was in November, 1904, a year after the operation. Then she had all the motions of the elbow, forearm, wrist, and fingers almost complete, but not as strong as formerly. Sensation had returned to normal apparently, and she can readily distinguish between heat and cold. She no longer burns her fingers. If another case of this nature presents itself for treatment, I should rather choose to resect the bones than splice the tendons. Although the forearm would be shortened, the hand, etc., would be stronger. The tendons and nerves should always be liberated, and I think oil used.

Literature.—Volkman was the first surgeon to write on this subject and to point out the dangers to muscle following tight bandaging, too-firmly applied splints and Esmarch's bandage too long in use. The damage done by these means became known as "Volkman's paralysis," "ischemic paralysis," "ischemic atrophy," etc. Inasmuch as the muscles with their tendons and the nerves are the chief structures involved, the title of my paper "Ischemic Muscular Atrophy, Contractures and Paralysis," may not be inappropriate. The older physiologists conducted some experiments on the influence on muscles when the arteries were tied,—*i.e.*,

giving rise to paralysis. Hallen (1766), Stetson and Lesser. Kuhne concluded (*a*) loss of irritability, (*b*) paralysis of the muscle, and (*c*) rigor of the muscle, to be due to inhibited nutrition.

Carl Ludwig proved that rigor mortis, death of muscle, giving rise to paralysis. Haller (1766), Stetson and Lesser. was due to lack of oxygen.

Kraske has shown that muscles cannot stand the complete absence of the arterial blood current for six hours (Bernays).

The histologic changes have been studied by Keidelberg, Kraske, Lesser, Bernays, Batton, and others. Metchnikoff and Soudakewitsch established the fact that muscular atrophy in the strict sense of the word should be ranged under the group of phenomena caused by phagocytes (collateral).

Fortunately cases of ischemic atrophy and paralysis are rare. In 1888, at the German Society of Surgeons, held at Berlin, it is reported that Lesser saw seven cases; Bardenheuer, four; Helferich, three; and Konig, seven cases.

Dr. A. C. Bernays, of St. Louis, Missouri, published an able and excellent article in the *Boston Medical and Surgical Journal*, May 21, 1900, "On Ischemic Paralysis and Contracture of Muscles," from which I have extracted some of the data in this production. He does not report any of his cases, but makes mention of them. The first seven references here given were compiled by him.

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- ⁷ See Transactions of German Society of Surgeons, 1888, xi, Berlin.
- ⁸ Jackson. Boston M. and S. Journal, July, 1838.

- * Dwight. Boston M. and S. Journal, October, 1838.
- ¹⁰ Gross. Die Krankhaften Geschwülste, Band I, S., 482.
- ¹¹ Page. Lancet, Jan., 1900: "Volkmann's Ischemic Paralysis."
- ¹² Bernays. Boston M. and S. Journal, May 24, 1900.
- ¹³ Wallis. The Practitioner, 1901, p. 429.
- ¹⁴ Metchnikoff and Soudakewitsch: Annales de l'Institut, Paris, Jan., 1892.
- ¹⁵ Donald Fraser. Glasgow Medical Journal, July, 1892, quotes a case of atrophy of the muscles of both arms in a man who had suffered from an accident in which both these members had been stretched for twenty minutes. (Mentioned here for collateral study.)
- ¹⁶ Lemoine. Lyons Medical, Lyons, Dec., 1891, reports the case of a man in whom atrophy of the deltoid biceps, triceps and supinator longus muscles was caused by the compression of a strap used for carrying parcels. (For collateral study.)
- ¹⁷ Littlewood. Letter to Lancet, Jan. 5, 1901, expresses the opinion that the term "ischemic paralysis" is a misnomer, the contraction occurring after elbow injuries in children being really due to the contraction of cicatricial tissue, the result of laceration of the flexor muscles. A swelling in the upper portion of the flexor muscles of the forearm has been present in all cases which have come under his notice. Splint pressure and splint sores are in no way related to the production of the deformity. (I Year-Book, Goul, 1902). (For collateral study.)

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 10, 1906.

The President, Dr. GEORGE WOOLSEY, in the Chair.

OPERATION FOR EPITHELIOMA OF THE HEEL.

DR. CHARLES L. GIBSON presented a man, 58 years old, who ten years ago had his left leg amputated below the knee for a condition which he was told was a cancer.

The lesion on the right heel was first noticed about a year ago. It appeared as a scaling of the heel, and then became papular. When Dr. Gibson saw the patient, in the summer of 1905, there was an ulcerating lesion of the right heel, about two and a-half inches in circumference. It proved to be an epithelioma. Dr. Gibson performed an atypical operation, which consisted in a removal of an oblique wedge of the posterior portion of the os calcis, together with the tumor. The tendo achillis, which had been divided, was lengthened by splitting it downward from the middle of the calf, and nailed to the lower end of the sawn surface. An autoplasic flap, designed eventually to cover the bone was now made by reflecting the skin towards the popliteal space; another flap was detached from above downward, and the free ends were sutured together. It was intended eventually, after firm union had taken place between these two flaps, gradually to sever the pedicle of the upper flap, when this whole flap would be turned downward and the free end sutured to the lowest level of the defect of the heel.

Unfortunately, there was not enough circulation in the extremity to warrant such a procedure, as the flaps failed even to unite.

The defect was subsequently remedied in part by skin grafting on several occasions.

Such an autoplasmic operation had the patient's circulation been suitable, should have been very efficient, and in a suitable case is to be recommended. The wound is not quite healed, but the patient already has considerable use of the limb.

DR. GEORGE WOOLSEY narrated the history of a case where epithelioma developed at the site of an old ulcer of the leg, at the junction of the middle and lower thirds; the growth was thoroughly excised, and skin-grafts applied. The operation was followed by an early recurrence. Another surgeon then performed a similar operation with a like result, and the leg finally had to be amputated.

SARCOMA OF THE NECK TREATED BY MEANS OF THE MIXED TOXINS OF ERYSIPELAS AND BACILLUS PRODIGIOSUS.

DR. WILLIAM B. COLEY presented a man, 32 years old, who was referred to him on October 17, 1905, by Dr. Arpad G. Gerster, as an inoperable case of recurrent, small, round-celled sarcoma. His family history was good. His personal history was as follows:

In about the middle of August, 1905, he noticed a swelling on the left side of the neck, just behind the sterno-mastoid muscle. At about the same time he also noticed an enlargement of his left tonsil; there was no pain at first, but as both tumors increased rapidly in size, they soon became painful. In the latter part of August, 1905, the patient was operated upon at St. Mark's Hospital by Dr. Carl Beck, who made an attempt to remove the tonsil tumor, as well as that of the neck, he found it impossible, however, to make a complete excision. The patient was immediately put upon the X-ray treatment every other day, and also received radium treatment externally and internally; the latter, however, had little if any influence in checking the rapid growth of the tumor. On October 13, while under the care of Dr. Goldwater at the New York Polyclinic, a portion of the tonsillar tumor was removed and examined by Dr. F. M. Jeffries, Prof. of Pathology and Director of the Pathological Laboratory of the New

York Polyclinic, and also by the Practitioner's Laboratory, both of whom reported the tumor to be a small, round-celled sarcoma. On October 17, when Dr. Coley first saw the patient, physical examination showed the following condition:

The left side of the neck was occupied by a globular tumor, about the size of half an orange; it extended from the angle of the jaw in front, to the mastoid process behind, and downwards nearly to the clavicle. Its consistence was about the same as that ordinarily found in round-celled sarcoma; the skin was not adherent. Examination of the left tonsil showed it to be enlarged to double its normal size. The patient's general health had been but little affected. He was admitted to the General Memorial Hospital on October 17, 1905, and immediately put upon the mixed toxins of erysipelas and bacillus prodigiosus, without any other treatment. Daily injections were given, alternating, one day into the tumor direct; the other, into the pectoral region. The highest dose given was seven minims. His temperature ranged between 99.5° and 103° . In less than a week there was decided decrease in the size of the tumor, and an increase in its mobility. The diminution steadily continued and at the end of six weeks, both the cervical and tonsillar tumor had apparently entirely disappeared. The patient was shown before a meeting of the Harlem Medical Society on November 25, 1905. He left the hospital at the end of seven weeks, and although there were no visible remains of the tumor, the toxins had been kept up twice a week in the pectoral region, as a prophylactic measure against further recurrence.

It was interesting to note that the toxins used in this case, prepared by Dr. B. H. Buxton, of the Loomis Laboratory, were eight months old.

DR. HOWARD LILIENTHAL said that some weeks ago he had seen the case reported by Dr. Coley, and at that time there was considerable brawny infiltration present, which he supposed was due to the injections. This had now apparently disappeared, and the cure seemed, for the present, at least, to be complete. The speaker said that while he did not favor the use of the mixed toxins in operable cases, he thought the remedy should always be resorted to in dealing with inoperable conditions, and as a postoperative prophylactic measure, especially in sarcomata of the spindle-celled

variety. He had every reason to believe that he had delayed and in some cases prevented the recurrence of these malignant growths by this method. In one case of cysto-sarcoma of the rib involving the pleura, in which only a partial excision of the malignant growth was possible, the injection of Coley's fluid was apparently followed by an absolute cure. Between three and four years had now elapsed since the operation without any signs of a recurrence.

DR. WOOLSEY said that he had tried the mixed toxins, either alone or in combination with the X-rays as a prophylactic measure after operation, and thus far he had never seen much benefit in sarcoma of the round-celled variety. He mentioned the case of a small boy with a sarcoma in the carotid region. There were a number of recurrences, and after the growth had been removed for the fourth time the mixed toxins and X-rays were given as a prophylactic measure, but without any result. In the spindle-celled variety, the speaker thought the treatment offered a better chance of cure.

DR. COLEY, in closing, said that his earlier opinion, that most of the cures by means of the toxins were found in the spindle-celled variety of sarcoma, and that the toxins were but seldom successful in the round-celled variety, had not been borne out by the facts. His own cases, recently collected, showed of 34 successful cases, 16 spindle-celled, 12 round-celled, two mixed-celled, one epithelioma, and three in which no microscopical examination was made, although the clinical appearances, together with a history of recurrence, left little doubt as to the diagnosis. Of 56 cases treated successfully by other surgeons, 17 were of the round-celled, and 14 of the spindle-celled variety.

Dr. Coley said he believed very strongly in the wisdom of adopting the plan advocated by Dr. Lilienthal; namely, to use the toxins after operation in all cases of primary sarcoma as a prophylactic against recurrence. The speaker said he had done this in a considerable number of cases for several years, and he believed that in many instances the measure had prevented a recurrence.

FRACTURE OF THE FEMUR.

DR. ROYAL WHITMAN reported the case of a boy who entered the Hospital for Ruptured and Crippled in September, 1905. Five weeks before he had sustained a fracture of the left thigh.

The limb was put up in plaster-of-paris by the family physician, and when this was removed, at the time of the boy's admission to the hospital, there was considerable deformity and shortening, and over-lapping of about $1\frac{1}{2}$ inches. Under an anæsthetic after considerable manipulation and stretching, the fragments were brought into apposition, and a plaster-of-paris spica bandage applied, together with traction plasters, in order to prevent recurrence of deformity.

The bones united readily, and the boy now had a perfect limb. The chief point of interest in the case was the fact that the shortening of the limb had been successfully overcome five weeks after the receipt of the injury.

"THROMBOSIS OF THE MESENTERY."

DR. CHARLES L. GIBSON spoke of two cases of the kind that had come under his observation. The first one he saw with Dr. Blake about fifteen years ago. The patient was a man who had been an inmate of the hospital for some time with an inveterate syphilitic ulcer which failed to heal, and one day he suddenly developed an attack of complete abdominal obstruction. Upon opening the abdomen, the condition described by Dr. Hawkes was found, the section of the gut involved having been reduced to a soft, gelatinous mass. The patient promptly died.

The second case was also a man, who was admitted into the medical ward of the hospital with the symptoms of acute pyæmia. The abdominal symptoms, in the beginning, were not prominent. He had chills, and his temperature ranged as high as 106° F. There was a cardiac bruit, and the case was supposed to be one of malignant endocarditis. Subsequently, he developed acute abdominal symptoms, and on exploring the abdomen, the lower coils of intestine were found to be in this same gelatinous condition. That patient also died.

Dr. Gibson said the only suggestion he could make in the line of treatment was in a prophylactic way. We knew that this condition occasionally occurred, and its possibility should influence the surgeon to handle the mesentery with the greatest respect in the course of intra-abdominal work.

DR. JOSEPH A. BLAKE said that about a year ago a man entered the hospital from up the state. He had a fistula leading to

the small intestine, and gave a history of thrombosis of the mesentery, from which he had recovered. It was apparently one of those cases in which the circulation of the gut had not been completely cut off, and the surgeon in whose hands he fell did the very best thing under the circumstances, and made an artificial anus in the small intestine. According to a letter received from the operating surgeon, several feet of intestine were involved and the lesions in the mesentery and intestine were typical. The speaker said this was the only case he knew of which did not end fatally.

Dr. Blake said he recently saw a case of mesenteric thrombosis following an operation for appendicitis. The appendix was seven inches long. Following the operation, which was done towards the end of the attack, the wound became infected. This was relieved by taking out a couple of stitches. The patient's temperature then fell to normal, and remained so for five days and during that period there still remained slight abdominal pain and tenderness. The appetite was fair; there was some diarrhœa. The patient appeared to be getting well, when he suddenly developed acute symptoms of intestinal obstruction, and when Dr. Brewer opened the abdomen he found a gangrenous area in the ileum several feet from the ileo-colic junction, with adhesion to the abdominal wall, and a slight perforation. There was nothing to explain the condition unless it was a thrombosis of the mesenteric artery or vein, which had extended so as to cut off the circulation in this part of the intestine. A resection was done, but it proved of no avail.

DR. HOWARD LILIENTHAL said he had seen several cases of mesenteric thrombosis following appendicitis operations, all of which went on to a fatal termination, but without the occurrence of gangrene of the intestine. The speaker said he did not know to what extent the mesentery was involved in these cases, but it was found, on operation, that it was thickened and œdematous, and obviously thrombosed. Dr. Lilienthal said that personally he had never seen any of these cases get well, but he recalled one case, a private hospital patient under the care of Dr. Gerster, who after a prolonged and severe illness finally recovered. During the course of his illness, the liver became swollen to such an extent that hepatic abscesses were suspected, and the suggestion to



FIG. 1.—Radiograph of normal and injured extremities taken July 10, 1904, two months after injury. Anteroposterior view.



FIG. 2.—Lateral view two months after injury. (Note—The spots are plate defects.)

incise the liver was made to Dr. Gerster, but he refused to interfere, and the patient eventually got well.

In thrombosis of vessels of considerable size, gangrene was of course inevitable.

DR. HAWKES, in closing, in reply to Dr. Lilienthal, said it depended to a great extent on the amount of mesentery that was thrombosed as to whether or not a collateral circulation could be established.

Stated Meeting, January 24, 1906

The President, Dr. GEORGE WOOLSEY, in the Chair.

OPEN OPERATION FOR SEPARATION OF LOWER FEMORAL EPIPHYSIS.

DR. JOHN A. HARTWELL presented a boy, seven years old, who, on May 28, 1904, fell in front of a wagon, the wheel of which passed over his left thigh just above the knee-joint. He was taken to a hospital, and examination on admission showed every evidence of a fracture near the lower end of the femur. A few days later, under ether, the limb was put up in a plaster splint, in what was regarded as a favorable position to prevent shortening. This splint was left on for about a month, and upon its removal it was found that union in a faulty position had taken place.

Dr. Hartwell first saw the patient about this time, in the Second Surgical Division of Bellevue Hospital. An examination of the left lower extremity showed a shortening of over an inch, with the knee-joint practically immobile in a slightly flexed position. There was much thickening about the lower end of the femur, and the exact condition was not readily made out. The radiograph, however, showed the injury to be a separation of the lower femoral epiphysis, that fragment being dislocated on the anterior surface of the shaft of the bone, and riding upward for the distance of its thickness—*i.e.*, about an inch and a half. (Figs.

1 and 2.) The lower end of the upper fragment was thus forced down into the popliteal space.

On July 30, 1904, an incision about an inch and a-half long was made along the outer side of the knee-joint, extending from the head of the fibula upward. The incision was carried down to the bone, the joint structure being retracted downward, so that the joint, apparently, was not opened. The periosteum was then stripped from the lower end of the femur upward for a distance of about four inches from its anterior, external and posterior surfaces. The lower end of the shaft was found imbedded in the popliteal tissue, with the epiphysis completely separated from it, and lying directly on its anterior surface, with the condyles looking forward and downward. The separated surface of the epiphyseal end was thus in close contact with the anterior surface of the lower end of the shaft, to which it was united by a firm callus. By the use of a large carpenter's chisel, a few blows of the mallet separated the two fragments, and then, with blunt, flat instruments and curved hooks applied to the two fragments, the epiphysis was gradually slid down to its normal position against the lower end of the shaft, where it rested with very little tendency to a recurrence of the deformity, the surface of the condyles now looking in the normal direction.

It was now possible to flex the leg on the thigh well toward a right angle without dislocating the fragments, showing that the interference with mobility had been removed. The periosteum and other soft parts were then sutured in position and a moderate-sized drain inserted down to the bone, and a copious sterile dressing applied. The joint was believed to have been unopened. A plaster splint was then applied with the leg in the extended position, including the whole lower extremity, with the pelvis.

The subsequent convalescence was by no means satisfactory. The superficial wound became infected rather severely, which kept it open for several weeks. The infection, fortunately, did not seem to lead down to the bone, and at no time was there any evidence of involvement of the joint in this process. The wound healed slowly by granulation; at the end of five weeks it had completely cicatrized, and union of the bony fragments was complete.

Owing to the presence of the suppuration, and fearing that the process had interfered with bony union, no attempt had been made up to that time to bend the joint, so that it was then firmly fixed in an extended position. Under ether, the knee was flexed seven weeks after the operation, and about three weeks after the cessation of all suppuration. The trauma inflicted by this manipulation again started up the suppurative process, necessitating extensive incisions on both sides of the joint. The acute symptoms subsided rapidly, and a short time afterwards a very small fragment of bone was discharged, showing that the original process had undoubtedly communicated with the bone at some point. The wound then healed by granulation (and on December 3, when the boy was about to be discharged, he contracted erysipelas at the site of a small abrasion over the middle of the left tibia. This responded readily to treatment, and he left the hospital ten days later, five months after the original operation.

In spite of the infectious complications that had occurred, no serious damage had resulted to the bone or the knee-joint, the latter having been without any restraint since the removal of the splint, five weeks after the operation. While no attempt had been made to limber the joint by passive manipulation, the patient had been encouraged to use it as much as possible.

The following note was made upon the condition of the joint on January 4, 1905: The contour of the left knee was uniformly enlarged, the enlargement being slightly more marked on the internal aspect. Extension could be carried to within about 30 degrees of the normal, and flexion to about two-thirds of the way to a right angle, the arc of motion being about 30 degrees. The left lower extremity, in as full extension as possible, measured, from the anterior superior spine to the internal malleolus, 22 inches. The right extremity measured the same in the same position. The circumference of the left knee was eleven inches; of the right, ten and one-eighth inches.

On March 7, 1905, the length of both lower extremities had increased by half an inch, and the patient's total height was forty-five and a-half inches. The left knee could be fully extended, and flexed to a right angle. The patient walked without limping.

On January 8, 1906, the right lower extremity, as taken above, measured twenty-three and three-quarters inches; the left the same. The patient's total height was forty-seven and a-half inches. The knee could be flexed to about 30 degrees beyond a right angle, and extension was complete. The anatomical landmarks about the knee seemed to be in a normal relation. (Figs. 3 and 4.) Thus, in one year since his discharge from the hospital, the patient's lower extremities had each grown one and three-quarters inches, showing that there was no impairment of growth as the result of the injury to the lower femoral epiphysis, and the mobility of the joint had become about normal.

Dr. Hartwell said the interest in this case did not attach to its rarity, as more than one hundred cases of this injury are reported in the literature, and all the epiphyseal separations, the one at the lower end of the femur is the most common. The rule, too, was to find the displacement exactly as was met with here. The interesting feature of the case lay rather in the fact that the displacement of the separated epiphysis was not corrected for more than two months after the accident, and that notwithstanding this fact, there had been no loss of growth of the injured limb.

Scudder, in speaking of this injury, made the following statement: "If the epiphysis is separated without great laceration and periosteal denudation, and is replaced soon after the injury, the chances are that there will be a minimum amount of shortening." Stimson also speaks of the liability of the arrest of growth, though with proper correction of the displacement this is not the rule. The great resistance to any interference of the growth was well illustrated in this boy, where the original trauma was very severe, where replacement was so long neglected, and where extensive suppuration took place immediately at the site of the fracture line, if not actually involving it.

DR. HOWARD LILIENTHAL said he had never seen a case like the one reported by Dr. Hartwell, in which there was separation of the lower femoral epiphysis. In dealing with such a condition, it was certainly a serious mistake to regard it as a fracture, and simply put the limb in a plaster splint. The result in Dr. Hartwell's case was excellent, and evidently the growth of the limb

FIG. 3.—Radiograph taken Jan. 8, 1966, eighteen months after operation, showing normal position of epiphysis. Anteroposterior view.



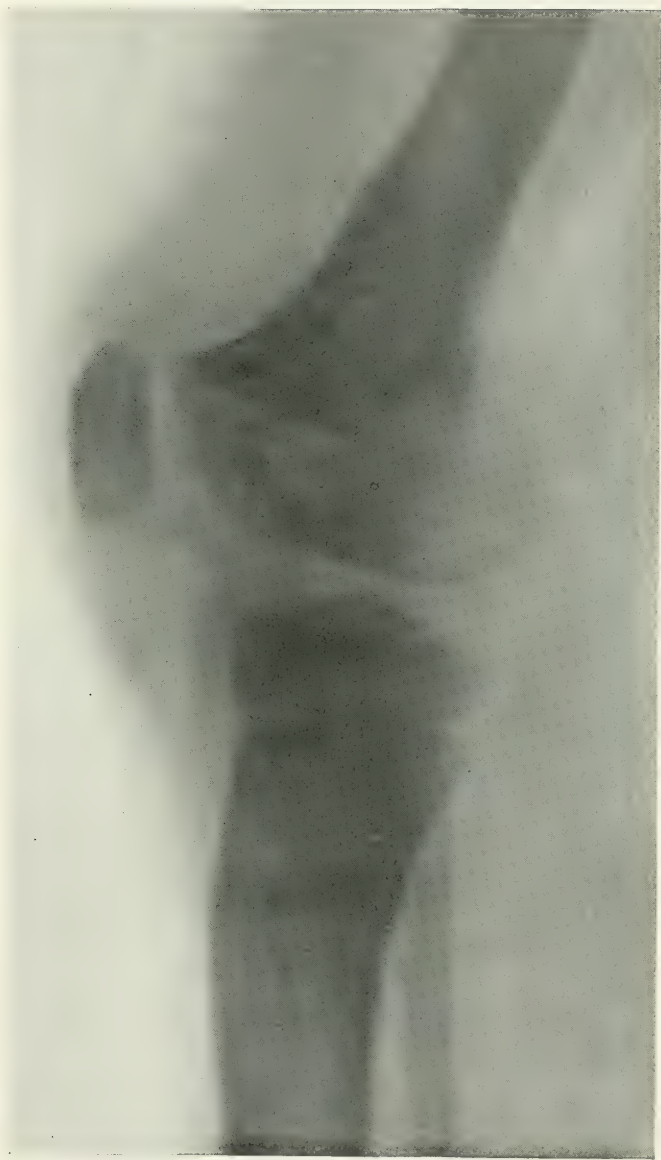


FIG. 4—Same as Fig. 3. Lateral view.

had not been interfered with, in spite of the delay in correcting the deformity and the suppurative process that complicated the boy's convalescence.

PERINEAL PROSTATECTOMY.

DR. CHARLES L. GIBSON presented three men who had been subjected to perineal prostatectomy within the past four to six weeks, and who were aged, respectively, 84, 63 and 59 years. In each case the wound was healed, or practically so, the control was perfect, there was no residual urine and no cystitis.

Previous to adopting his present technique, Dr. Gibson said, he had been dissatisfied with his results by any of the methods, suprapubic, and combined suprapubic and perineal, with or without the formal exposure of the prostate by a transverse dissection of the perineum. In the last two years he had had no mortality, although many of his patient were far from good risks.

With regard to the technique used, Dr. Gibson said it had been as follows on all cases operated on for the past two years: An external urethrotomy was performed, then, in some cases, particularly stout individuals. Young's tractor was introduced, while, in thin persons, suprapubic pressure sufficed. Then, after division of the recto-prostatic septum or the recto-urethralis muscle with the scissors, the prostate was enucleated in one of three ways: (*a*) In toto, as in Case I, being very easily shelled out of its surroundings; (*b*) the lateral lobes were peeled off of the urethra by beginning the enucleation behind the prostate, and working from behind forward; (*c*) piecemeal extraction was adopted in dealing with very large growths, working from the urethrotomy opening towards the periphery or capsule.

Dr. Gibson said that in none of these operations had hæmorrhage ever been a serious factor, nor had there been any damage to the rectum. Drainage was provided by a large rubber perineal tube, well surrounded by sterile gauze packing. The tube was removed at an early date, and the patient was allowed to leave his bed in eight days.

DR. PARKER SYMS said that the method described by Dr. Gibson was essentially the one which he had employed in all excepting his first case. He makes a median perineal incision

and reaches the prostate, as suggested by Alexander, through an incision in the so-called prostatic sheath. He always exposes and recognizes the sheath and prostate by sight.

The speaker said that while all enlarged prostates may be removed by this method, yet in some cases, enucleation will be much easier than in others. In one recent case he removed the prostate in a single piece, and the procedure had occupied but a few moments, but after the tube was removed, the patient had been unable to pass urine on account of papillomata which were just within the bladder neck. These had to be removed a few days later. This shows that one should very carefully explore the bladder orifice.

Speaking of the after-treatment of these cases, Dr. Syms said he always removes the tube at the end of forty-eight hours, and that he always gets the patient out of bed at that time, unless there was some special reason for keeping him there longer.

In the final healing of these wounds, he had often met with considerable difficulty, especially during the later weeks. This seems to be due to the fact that the healing proceeded from without much quicker than from within, with a tendency toward pouch formation.

Dr. Syms said that his results from perineal prostatectomy had been most satisfactory, and it was only in exceptional cases that complications arose. He regarded the perineal method of approach as the most simple and direct; it involved the least number of important organs and gave the patient the most rapid and safe convalescence.

Dr. Syms said the so-called method of Young, so far as the exposure of the prostate was concerned, was first described by the French surgeons, Albarran, Proust, and others; and that this method of exposing the prostate had resulted in the formation of more rectal fistulæ than any other. In the elaborate dissection that it required, one was very liable to wound the rectal wall.

DR. HOTCHKISS said he was glad to see the results in Dr. Gibson's cases of perineal prostatectomy, because he had felt for a long time that the perineal operation done through a small median perineal cut, and largely by the sense of touch instead of

sight, was for some reason less liable to be complicated by accidental injuries of the rectum, and the consequent fistula, than some of the more elaborate methods of exposure by the curved transverse incision, and dragging down the prostate by a metallic tractor within the bladder. In fact, the only case in which a rectal fistula had resulted in his own practice was in one where such an incision and a careful exposure of the tumor was made. He had first done the operation through the median perineal incision in 1896, enucleating the prostate easily with the finger by finding the planes of cleavage on either side of the urethral incision.

DR. F. KAMMERER said he always did the perineal operation, and in only one instance had he met with the accident of wounding the rectum. He usually made the curved incision across the perineum which he did not think added to the difficulties of the operation, as it usually enabled him, within a very few minutes, to get down to the prostate when assisted by the left index in the rectum. He considered it wise to lay open the field of operation for inspection. In the case where the rectum was wounded the patient had been improperly prepared and the rectal pouch in the wound was filled with fecal matter, a rupture occurred before the patient was fully anæsthetized and was vomiting, while a blunt retractor was depressing the rectum and anal region.

DR. LILIENTHAL said he had never heard of a rupture of the rectum occurring in the course of a suprapubic operation on the prostate. He thought it only fair that something should be said in favor of that operation. Unlike the perineal method, it never, so far as he knew, resulted in a loss of sexual power, whereas it was well known that many of the perineal operations were followed by total loss of sexual power. He mentioned one case, a man 74 years old, where the suprapubic operation on the prostate was followed by increased sexual power.

Where the perineal operation was contemplated, it was absolutely essential that a preliminary cystoscopic examination be done. This was unnecessary with the suprapubic method, which afforded a perfect view of the interior of the bladder.

An injury to the rectum, which occasionally occurred in the course of a perineal prostatectomy, might not manifest itself for several days, when the rectal tissue sloughed out, leaving a rather hopeless state of affairs. A number of such cases had been

reported. If the accident was discovered at the time of the operation, the perforation could be sutured, but after sloughing occurred, that was out of the question.

Dr. Lilienthal said he had very recently done his thirty-ninth suprapubic prostatectomy. The operation, which was entirely successful, was completed in ten minutes. Of the thirty-nine cases, two died. Those that recovered were able to urinate as well as ever. In all of them, the syphonage method of draining the bladder was employed.

The speaker thought that while in some hands the perineal operation might be preferable to the suprapubic, he had no reason for feeling dissatisfied with the latter. The operation, if properly done, should give a very small mortality. The method possessed peculiar advantages in dealing with very old or feeble individuals who were bleeding. In such cases the bladder could be opened from above in a few minutes, and packed, and then the actual prostatectomy could be postponed for a week or longer, if the patient's condition indicated the wisdom of delay. Such a two-stage operation could not be done through the perineum.

In reply to a question as to the grounds upon which he based his assertion that the sexual powers were preserved by the suprapubic method, Dr. Lilienthal said he did not know. He simply knew from his own experience and from that of others that the sexual power was not impaired by the suprapubic operation, while the loss was comparatively common after the perineal method, even in young men who had been operated on through the perineum for the relief of a prostatic abscess.

DR. F. TILDEN BROWN said he agreed with Dr. Gibson that it was of decided advantage, whenever possible, to complete the operation without traction, as it relieved one of the dangers of the metallic tractor, which was very liable to tear through the vesical mucosa. At the same time, there were a certain number of cases in which it would prove extremely difficult to effect enucleation of the enlarged prostate without other aid than suprapubic pressure. In certain instances of that kind, Dr. Brown said, he has found that pressure through the rectal wall with the gloved hand was very satisfactory.

The speaker said that the position advocated by Dr. Gibson, namely, elevation of the pelvis and hyperflexion of the thighs,

was a very important feature of the operative technique. The possibility of injuring the rectal wall was minimized by keeping the patient in this position, and by following the technique of Young and recognizing the landmarks, keeping close to the bulb, with the full understanding that this bulb, on its posterior surface, rises right up to the membranous urethra. The preliminary injection of a 1-1,000 adrenal solution added much to the satisfaction and ease of the dissection, as it obviated the necessity of mopping away the blood or working in the dark with the finger.

DR. GIBSON, in closing, said that his personal experience with suprapubic prostatectomy had been very unsatisfactory, and for that reason he had abandoned it. In regard to the question of the possible loss of sexual power after the perineal method, he looked upon it as a kind of bugaboo which might well be disregarded. Prostatectomy was a life-saving measure; not one of expediency, and the question of saving the sexual power in this class of patients was of secondary importance.

DISARTICULATION AT HIP FOR SARCOMA.

DR. C. A. McWILLIAMS presented a man, 23 years old, who was operated on in February, 1900, by Dr. Charles K. Briddon at the Presbyterian Hospital. The family history was unimportant. There was no specific history, but three years prior to admission, the patient had been operated on for inguinal adenitis following chancroids. Seventeen months prior to admission he had sustained a slight injury to the right knee. Nine months later he noticed slight pain and swelling in the right knee; this slowly but gradually increased in severity extending a little above the knee. During the last month, the growth had been more rapid. There had been only occasional pain at night, and the patient had been able to work up to within two days.

At the time of his admission to the hospital, the patient was poorly nourished and anæmic. The left posterior cervical glands, both axillary, both epitrochlears and both inguinal chains were palpable. The right inguinal glands were larger than the left. In the right iliac fossa there was a mass the size of an English walnut, just above Poupart's ligament; it was not tender, it moved freely over the deeper parts, and the abdominal wall was

freely movable over it. Apparently, it was an enlarged gland. There was a scar, three inches long, in the right inguinal canal, showing the site of the previous operation.

The lower end of the right femur was much enlarged, being three and a-half inches larger in circumference than its fellow at the same level. The swelling was hard and slightly tender; the skin over it was freely movable; there was no redness nor inflammation of the skin. The tumor was firmly adherent, and incorporated with the femur. Flexion of the right knee was possible to the extent of 80 degrees.

Operation, February 5, 1900. A section was removed from the growth on the outer side of the limb, and by frozen section showed sarcoma. A disarticulation of the hip was then made by Wyeth's pin method. The patient made an uninterrupted convalescence, and left the hospital on the twenty-second day after the operation. There were no signs of a recurrence at the present time, a period of almost six years.

The pathologist, Dr. Thacher, made the following report: "Sections from the projecting part of the tumor, which was not calcified, showed a connective-tissue growth rich in spindle-cells, arranged parallel in strands, with a moderate amount of fibrinous, intercellular substance. Diagnosis, fibrosarcoma."

TUMOR OF THE PAROTID.

DR. F. KAMMERER presented a man, 55 years old, who was operated on four years ago for a carcinoma of the right parotid gland. The tumor soon recurred, and when the patient next came under Dr. Kammerer's observation, in May, 1905, there was a growth about the size of an adult fist, involving the right side of the face and the corresponding ear. It was questionable whether the case was operable or not, but it was finally decided to attempt it.

After ligating the external carotid, the incision was carried upward, and the growth removed as completely as possible, including the entire right ear, and the superficial layers of the mastoid process. Several enlarged lymphatic glands near the angle of the jaw were also excised.

Up to the present time, there were no signs of a recurrence.

A curious feature in connection with the case was that it was

impossible to locate the external opening of the right auditory canal in the cicatrix of the wound. The man was apparently able to hear as well on the affected as on the sound side.

"THE VALUE OF THE DIFFERENTIAL LEUCOCYTE COUNT
IN ACUTE SURGICAL DISEASES."

DR. CHARLES L. GIBSON read a paper with the above title (for which see page 485).

DR. HOTCHKISS said that the value of the differential, and the uselessness of the ordinary leucocyte count as an indication of the real severity of a case, was strikingly illustrated in a case of acute phlegmonous cholecystitis a few days ago, where the blood-count showed approximately only 5,000 white blood-cells although the patient's temperature was 107, but the differential count showed 87 per cent. of polynuclears. Immediate cholecystectomy was followed by recovery.

DR. LILIENTHAL said he had recently listened to a paper on this subject by Dr. Frederick E. Sondern, and since that time he had had a differential blood count made in practically all cases where the diagnosis was not absolutely clear at once, such as fractures, dislocations, and abscesses. He had found that, as a rule, the differential count was of decided value, and with the added advantage of the method described by Dr. Gibson, the difficulties surrounding the diagnosis and prognosis of certain obscure conditions should be still further overcome.

HYDRONEPHROSIS.

DR. GEORGE D. STEWART reported the following case: a girl, aged 17 years, was admitted to St. Vincent's Hospital, August 9, 1905, with the history that when ten years of age she was taken suddenly with nausea, vomiting, pain in head and back; the attack lasting for two weeks; similar attacks followed at irregular intervals, recurring, sometimes as often as once in two weeks. After two years she went to the Presbyterian Hospital, where she was subjected to an operation and discharged after a month of treatment, her wound having closed. Two weeks after her discharge, she had another attack of pain, returned to the hospital, remained in bed two weeks and was again discharged. From that

time until her admission to St. Vincent's the attacks kept recurring. Shortly before an attack she noticed she was unable to void urine, and when the attack was over, often passed large quantities. On August 9, 1905, she was admitted to St. Vincent's Hospital suffering from an attack of appendicitis. On the 14th of August her appendix was removed through an inter-muscular incision and the wound was closed without drainage. The appendix was found to be acutely inflamed. She made an uninterrupted recovery. On January 10, 1906, she was readmitted to the wards of St. Vincent's. During the interval since her last operation she had been working in the laundry of that institution. Had had occasional attacks of pain located higher in her abdomen, and neither so frequent nor so severe as those from which she suffered in the summer. On admission she had a temperature of 100.6, pulse of 96, respirations 24; complained of soreness under the right costal border. Examination in this region revealed a large, tender mass, which felt much like a distended kidney. On the day of admission (she was admitted at 1 P.M.), at 5 P.M., she passed five ounces of urine, and at 12, midnight, thirty-two ounces at one micturition; afterward the tumor in the right lumbar region was found much reduced in size. The urine was clear, acid in reaction, gravity of 1011, showed a trace of albumen under microscope, many pus-cells, some blood-cells and much débris; leucocytosis 13,600. Examinations of urine made from day to day showed little variation from the above. No tubercle bacilli could be found either by staining or by inoculation of the guinea-pig. There was present, however, an acid-fast bacillus of unclassified origin. Cystoscopic examination was made by Dr. Keyes, Jr., who reported pus coming from the right ureter and clear urine from the left. No radiographic examination was made. On the 19th of January, the usual lumbar incision for exposing the kidney was made. The kidney was easily exposed, its posterior surface was found markedly adherent to the lumbar fascia, it was three inches below its normal level, the pelvis was very much dilated. The inner surface of the dilated pelvis reached to and beneath the inferior vena cava, the lower border to and over the pelvic brim. In attempting to loosen the kidney from its adhesions, the thin kidney-tissue was torn, and the contents were spilled; as far as could be observed they consisted of

fairly clear urine. In view of the previous operation, of the fact that her left kidney was competent, of the distortion of the pelvis of the right kidney and the difficulty of making any plastic operation which would restore the continuity of the ureter and pelvis, it was decided to remove the right kidney. By very careful dissection the inner margin of the enlarged pelvis was separated from the spermatic vein and the inferior vena cava, the former resting directly upon the latter. After the separation was complete, the renal vessels were tied and here again great care was necessary, as the right renal vein was certainly not more than one-half an inch in length, and any tension on the kidney disturbed the course of the vena cava. The ureter was then ligated at about the pelvic brim and the kidney removed. The patient made an uninterrupted recovery, passing between thirty and forty ounces of urine the days following the operation. An examination of the urine on the 23d showed a normal secretion, except that there were some blood-cells and a few leucocytes present. Examination of the specimen shows that the ureter joins the dilated pelvis on its posterior aspect about two inches from the most dependent portion of the pelvic sac; the ureter turns almost directly upwards for about a quarter of an inch, and then downwards, so that the two limbs of the loop are parallel. At the summit of the loop the calibre of the ureter was considerably narrowed, elsewhere it was absolutely normal.

After the presentation of this case Dr. John Hartwell recalled the case as one in which a nephrorrhaphy had been performed for hydronephrosis.

DR. KAMMERER said that as there was a fair amount of kidney substance left in the specimen shown by Dr. Stewart, he thought an attempt at correction would have been justifiable, although he admitted that in the only well-pronounced case that had come under his care, he had removed the large sac, the walls of which evidently still contained a small amount of active renal tissue. But so much favorable testimony had been given by competent observers for the plastic operations on pelvis and ureter in these cases that he thought they should be tried when a fair amount of kidney substance still remained.

DR. ELLSWORTH ELIOT said that every effort had been made at the Presbyterian Hospital to find the early history of the case

reported by Dr. Stewart, but it had apparently been carried away by some one for reference, and had not been returned. The speaker thought that Dr. Stewart was quite justified in doing a nephrectomy in this case, basing his opinion upon an analogous case that came under the observation of Dr. F. Tilden Brown and himself in 1897. The case was one of intermittent hydro-nephrosis which was originally operated on by Dr. Charles K. Briddon, who had opened and drained the dilated pelvis of the kidney. In spite of this free drainage, which continued for a number of weeks through a lumbar incision, the symptoms of urinary obstruction were not entirely relieved, and they persisted even after the introduction of a ureteral catheter into the pelvis, and allowing it to remain there. The recurrent kidney crises were finally relieved by a nephrectomy. Dr. Eliot thought that plastic operations on the ureter or pelvis in these cases were theoretical rather than practical.

DR. HARTWELL recalled a case of intermittent hydro-nephrosis in a child in which the symptoms were relieved by correcting the kink in the ureter and then anchoring the kidney. He was unable to say whether permanent relief followed the procedure.

DR. F. TILDEN BROWN said he thought Dr. Stewart was not only justified in doing a nephrectomy but that he had adopted the only measure that would change the patient's condition from invalidism to perfect health. Leaving out of consideration the anatomical condition that was met with in the adhesions between the pelvis and the inferior vena cava, which had added to the difficulties of the nephrectomy and which would have rendered reposition of the kidney equally difficult and hazardous, the specimen showed that he had to deal with a large dilated pelvis and a small, angulated ureter. To have left the kidney under such conditions would only have proved a source of discomfort and danger to the patient and the speaker said he did not think that any plastic operation would have corrected the deformity.

Dr. Brown said that in a case that came under his observation last summer he exposed the left kidney and found a somewhat similar condition to that reported by Dr. Stewart, but it was not nearly so marked, and he was able to relieve the symptoms by turning the kidney so that the line of exit was

straightened. In the case mentioned by Dr. Eliot ureteral catheterization failed to relieve the symptoms.

EMBOLISM OF THE SUPERIOR MESENTERIC ARTERY, WITH GANGRENE OF THE INTESTINE.

DR. PARKER SYMS showed the specimen in this case. The patient was a man, 54 years old, who was admitted to the Lebanon Hospital on January 17, 1906, for a swelling in the submaxillary region, which proved to be an abscess, and was attributed to diseased teeth. The abscess was opened, and the patient was ready to be discharged, on January 23, when he had a sudden attack of abdominal pain, general in character, which subsided without the use of an anodyne. He had a similar attack in the evening, and the following morning he was found dead in the bath-room.

The autopsy showed a chronic endocarditis, and an embolism of the superior mesenteric artery, with gangrene of a portion of the gut. There was no perforation; no peritonitis.

Dr. Syms said he thought the endocarditis was the chief cause of death, probably hastened by a certain degree of sepsis. He did not believe the abdominal lesions were the sole cause of death, because perforation had not taken place and it seemed as though the patient had died of sudden heart failure.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, December 1, 1905.

The President, Dr. D. A. K. STEELE, in the Chair.

COXA VARA.

DR. LOUIS A. GREENSFELDER presented a boy, aged 17, who two and a-half years ago first experienced a dull aching pain on the inner side of left knee and in the popliteal space, described as lasting about one-half hour. This recurred at irregular intervals, alleviated by long-continued immobility of the limb plus extended knee. Pain and limping for the first two or three minutes of walking. No other symptom, either local or general, noticed for about six months; then pain gradually ascended to the thigh, and in another six months—one and a half years ago—involved the left hip. The pain was sharp and cutting, intermittent, severe enough to compel patient to cry out. Shortening of the limb was now noticed sufficient to cause the patient to walk on the left toes and pad the heel with leather; at the same time, he found he could not separate his limbs widely; the left leg seemed fixed at the hip. Flexion of the thigh on the abdomen was also inhibited beyond a right angle. Atrophy of the hip region was now noticed by the patient and soon involved the thigh. Patient remained indoors a greater part of the time, and limping was pronounced. There was no tenderness, change in color, nor swelling noticed. The deformity and limp have remained stationary. Patient has led an outdoor life for the past six months, and is in splendid physical condition. There is a history of a slight

traumatism. He recalls having been kicked by a horse two and a-half years ago, at which time the knee pain first began.

When the patient is in the recumbent position the left leg is in a position of eversion, but there is neither flexion nor abduction. Real shortening is apparent. Left gluteal region is smaller than the right. No lordosis. No kyphosis. Gluteal fold not obliterated.

Measurements.—1. Distance from top of great trochanter to Bryant's line, left $1\frac{3}{8}$ inches; right, $3\frac{3}{8}$ inches. 2. Distance from anterior superior spine to malleolus, left, $35\frac{3}{8}$ inches; right, $37\frac{3}{8}$ inches. 3. Top of great trochanter is two inches above the Rose-Nelaton line. 4. Distance from anterior superior spine to sacroiliac synchondrosis, left, $8\frac{1}{2}$ inches; right, $11\frac{1}{2}$ inches.

The X-ray picture illustrates the bending downward of the neck of the femur to a horizontal level and a posterior bending of the femoral neck.

DR. GREENSFELDER said that the cause of coxa vara may be due to late rachitis; juvenile osteomalacia; arthritis deformans. Frequently it is bilateral, and then it is associated with marked lordosis, simulating congenital dislocation of the hip. The disease occurs chiefly during the fourteenth and eighteenth years of the patient's life,—*i.e.*, the bone-growing period.

This patient was put to bed with a Buck's extension, which was continued for four weeks, with the internal administration of small doses of phosphorus; in the last two weeks massage and electricity have been employed. Limp and walk have materially improved.

DR. WALLACE BLANCHARD by invitation said that true coxa vara may be said to be characterized by a non-inflammatory softening of the neck of the femur, due to defective nutrition, and is accompanied or followed by a yielding to pressure and downward bending and torsion. In illustration he related the history of a case as follows:

The affection is bilateral and of the adolescent type. The patient, Mr. Geo. L., aged 21 years, is a native of Illinois. He belongs to a long-lived family and nothing that is pertinent can be found in the family history. He is slender and undersized. His height is five feet, four inches, and he weighs 130 pounds. His general health is excellent, and his habits are faultless.

He had diphtheria at the age of fourteen, and when convalescent a slight limp to the right became apparent, and from that time to the present there has been a steadily progressive shortening of the right leg. The right leg and thigh are markedly atrophic. The right gluteal crease lies one and one-half inches above the left. The right leg shows an adduction deformity of 30° , and a rotation out of 40° . The right trochanter is prominent, and over one inch above Nelaton's line. The flexion of the right thigh is restricted about one-third.

He wears a lift, one and one-half inches thick, under the right shoe, which just levels the pelvis. He habitually stands when in bare feet with the right heel elevated one and one-half inches from the floor. (Fig. 2). Measurements show that there is three-quarters of an inch of adduction shortening, and three-quarters of an inch of real shortening, as compared with the left leg:

In the left leg fifty per cent. of abduction is lost, and the trochanter major lies three-quarters of an inch above Nelaton's line, indicating a coxa vara bend downward of the neck, sufficient to reach a horizontal line, and giving approximately a real shortening of the left leg of three-quarters of an inch.

Since the real shortening of three-quarters of an inch of the right leg was found by comparing it with the left leg, which was already three-quarters of an inch short, it will readily be seen that the right leg has really a real shortening of one and one-half inches.

There has never been any pain or tenderness about either hip, except that prolonged standing produces a temporary feeling of soreness in the vicinity of the right hip-joint.

He walks with a decided limp to the right, notwithstanding the lift of one and one-half inches under the right foot.

The patient has been under the observation of Dr. Blanchard for two years and the real shortening has increased somewhat in both legs, and the adduction deformity of the right leg has increased about 10° in that time. The case may therefore be considered as still in the progressive stage. He is employed at bookkeeping. He sits most of his working hours, and has to be on his feet only occasionally. He does not want to be hampered with extension hip splints, but is ready to submit to an osteotomy



FIG. 1.—Showing the bending down of the neck of the femur in Greensfelder's case of coxa vara.



FIG. 2.—Bilateral coxa vara.

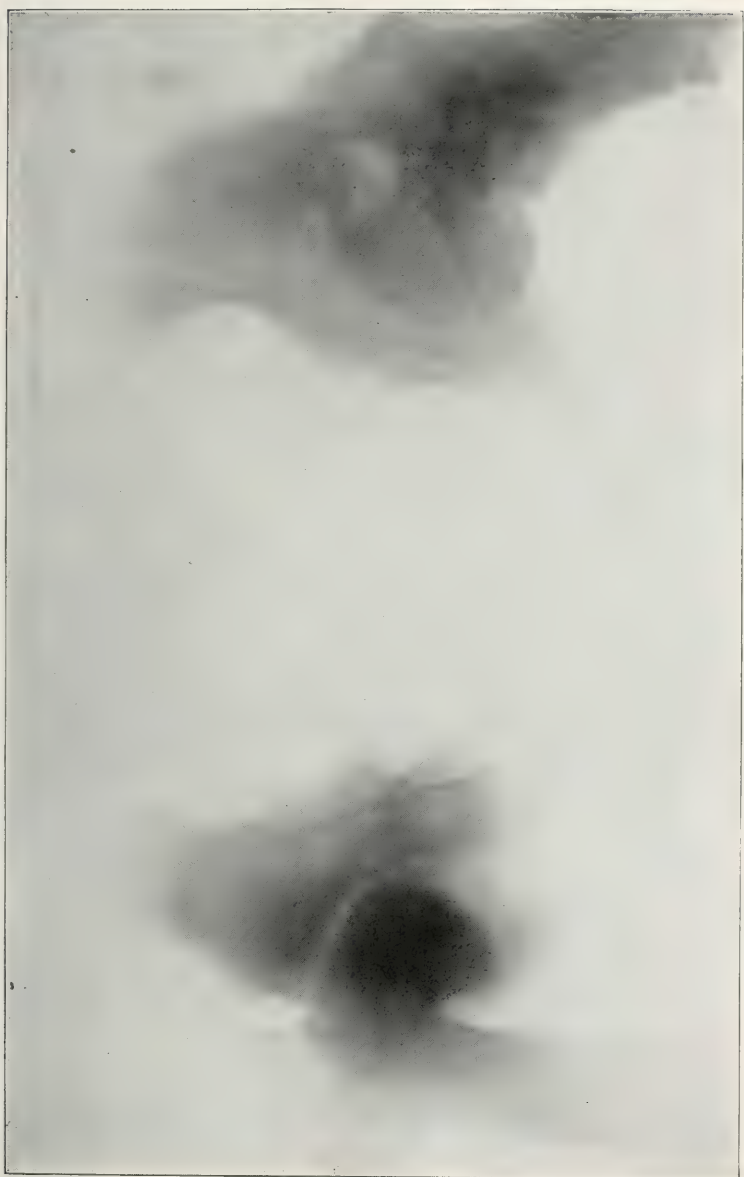


FIG. 3.—Skiagraph of a case of coxa vara. Dr. Blanchard.

for the correction of the adduction deformity of the right leg, as soon as he can be assured that the disease has run its course and that the femoral necks have reached firm bearings.

The skiagram shows the head of the left femur to be depressed, so that the neck lies in a horizontal position, making a right angle with the shaft, while the head appears to have retained its full rounded shape.

Much more grossly abnormal conditions are shown by the skiagram to exist in the head and neck of the right femur. The extracapsular neck has an inclination downward of some 65° from its normal position, and the inclination downward gradually increases in the intracapsular neck, until it reaches an obtuse angle with the shaft.

This distortion of the neck has reversed the direction and dislocated the head of the femur over the lower rim of the acetabulum until only the upper margin of the head lies within the socket. The upper half of the head has lost its rounded contour, and the upper half of the acetabulum appears to be filled with adventitious material. (Fig. 3.)

Altogether, this skiagram is a very remarkable picture of distortion from the normal shapes and relations, in and about the right hip-joint.

The history of the case leaves little doubt that the deranged nutrition and consequent softening and loss of resisting power in the femoral necks and head is of post-diphtheritic origin, and seems to sustain the views of Köhler that "the deformity is of such kind that it can be explained by the mechanical pressure, and tension effects on bone of yielding character."

The importance of diagnosis lies in the fact that subtrochanteric osteotomy is very successful in relieving the adduction deformity, and restoring normal locomotion, when operated after the coxa vara has ceased to be progressive.

DR. EDWARD H. OCHSNER said these two cases represented distinct types of coxa vara. Of the various cases he had seen he should be inclined to class these two cases in two distinct groups. The one demonstrated by Dr. Greensfelder made the impression of being a case of coxa vara due to traumatism. There was a great deal of doubt about this subject yet; but in looking at the X-ray prints carefully, one could not fail to notice

great difference in the two specimens. In Dr. Greensfelder's case the neck had not suffered much in length; it was almost normal except that it tilted and was horizontal instead of being at an angle of 127° . There appeared to be less trouble also in the acetabulum.

In the other type of coxa vara, due to softening of the bone, there was usually marked deformity of the acetabulum, and accompanying that was a marked shortening of the neck. The bone looked as though it had been soft at some time and had been moulded during the soft period. The X-ray picture brought out this point very forcibly. All things considered, he was inclined to think traumatism had a good deal to do with the case reported by Dr. Greensfelder, while the one shown by Dr. Blanchard was evidently a case of static coxa vara.

DR. EDWIN W. RYERSON stated that from the normal position of the neck of the femur and normal acetabulum it would be reasonable to conclude that there was a separation of the head of the femur. He would consider it either a fracture or separation of the head of the femur and not a case of true coxa vara.

DR. JOHN L. PORTER agreed with Dr. Ochsner that there were two distinct groups of cases, and in a large percentage of them, if studied carefully, there would be found a history of injury but oftentimes only a slight injury. He had been surprised at the cases in which separation of the epiphysis of the femoral head had taken place with very slight traumatism. He had seen a number of cases of this kind of deformity at the Cook County Hospital, and in almost all of them the ages were between twelve and twenty, most of them being young men. The history was that of slowly progressing disability, with marked adduction and a good deal of pain in the groin, or of slight traumatism followed by pain in the groin. While the patients thought they were practically well, there was always some limping and marked adduction. He mentioned the case of a farmer's boy, aged fifteen, who in loading hay used the thigh as a fulcrum for the pitchfork. The patient felt a sudden giving-way in the groin. He fell down. The pain was intense for a few minutes, but he was able to walk home a distance of half a mile. He remained about the house for a few days, until the pain and disability subsided, and went back to work a week later, and while plowing stubbed his

toe against a stone. The pain was so intense that he dropped in a furrow and had to be taken up and carried home. He was in bed three months, and an X-ray picture taken a year or more afterwards showed typical separation of the epiphysis of the head of the femur, with a bending downward of the neck, the epiphysis being caught above the acetabulum. Coxa vara was marked in this case. Adduction was marked, so much so that the only way to get the heel on the floor was by putting it over the other foot. Patient walked with marked limp. The more he studied these cases, the more carefully he looked for history of slight traumatism.

He had taken recently an X-ray of one of these cases within two days after the injury. The patient, a girl, thirteen years of age, in running about the house, bumped against a corner of a table or door, and experienced some pain, which lasted a few minutes, then passed off. She went about as well as she ever did for about forty-eight hours; then the parents noticed her limping, and she began to have pain in that hip. After making a tentative diagnosis of separation of the head of the femur, the X-ray picture showed a little gap at the line of epiphysis in the head, and by putting the leg up in extreme abduction and keeping it there, apparently she was getting well. The abduction was not limited.

He believed up to the time of the advent of the X-ray apparatus, surgeons mistook a large number of these cases for hip disease. Many of these cases of coxa vara had traumatic separation of the epiphysis, and he had been astonished, the more he saw these cases, at the small amount of traumatism which it took to separate the epiphysis at the head of the femur during adolescence.

DR. DANIEL N. EISENDRATH had seen the boy with Dr. Greensfelder, and concurred with him in the diagnosis of true coxa vara. He thought if the members studied the X-ray print carefully they would see that such a position was well taken. The condition was to be seen better in the print than on the plate itself. It was a rather unusual point for an epiphyseal fracture to occur. In the opposite limb, the left one, the epiphysis was at a point just back of the rotundity of the head. The X-ray showed a light shadow mixed with a dark one. This was the place where epiphyseal fractures ought to occur; but it would

seem rather unusual to have a fracture of the neck of the femur where a fracture of the epiphysis would be so much easier to take place.

Another point which seemed to him to confirm the diagnosis of coxa vara in this case was, that the head itself was flattened out. This showed that the head must be soft. Not only was the head softened and flattened, but there was compression or flattening of the lesser trochanter; so that the position taken by some of the speakers that the case might be one of epiphyseal fracture instead of coxa vara was not well taken.

DR. M. L. HARRIS said we should distinguish between two classes of cases, those which were static in their origin, and those which were traumatic. In the static variety there was a disproportion between the weight to be carried and the strength of the neck. This was known to be due to lack of strength in the neck, and there were several causes for it. The yielding was not only a gradual one, but it was more or less uniform. It never yielded at an acute angle of the length of the bone, but it was a uniform and gradual yielding. There was in almost all cases not only a yielding from above downward, but also from before backwards and there were evidences of weakness of some of the other structures. For instance, flatfoot was present in a large number of cases.

In the traumatic variety, while there was descent of the head and neck, many cases were not, strictly speaking, true coxa vara in the sense of being static. He could not agree with Dr. Eisendrath in regard to the interpretation given the skiagraph, as there was a distinct, sharply defined, marked angularity of the neck of the femur, a thing which one rarely or never saw in a case of true coxa vara. He also could not agree with Dr. Eisendrath that the epiphyseal line was the weakest point of the bone and that separation of the epiphysis occurred in preference to fracture of the bone. Epiphyseal separations are the great exception in comparison with fractures.

In these cases the bone yielded in preference to the epiphyseal line. The fact that the head was deformed was further evidence that there had been a traumatism and a fracture, causing the spreading-out of the head. The line next to the trochanter was something we did not see in cases of coxa vara. He believed

the case was distinctly one of traumatism to the head and neck of the bone and was not a true case of static coxa vara.

DR. WALLACE BLANCHARD could not agree with Dr. Eisendrath that separation should occur through the epiphysis. His experience in fractures close to the epiphysis was that they never occurred where they should. Of some eight hundred cases, of osteoclasia in two-thirds of which the epiphysis was under pressure, in only one was there separation of the epiphysis. If there was any opportunity at all, the fracture would occur outside and away from the epiphysis rather than in the line of the epiphysis.

In the skiagram of true adolescent coxa vara submitted by him a gradual bending would be seen,—not an abrupt bending, but a gradual giving-way, and this was what he called true coxa vara resulting from a non-inflammatory softening of the bone, gradual bending and giving-way without selecting any particular location or angle, or any one point of the bone.

Hoffa and many others had insisted that a large number of cases of coxa vara were of traumatic origin, but these were clearly proven to be of a different class. They were not true cases of coxa vara. He would not class the case of Dr. Greensfelder as one of true coxa vara, but rather as one of impacted fracture. He had seen cases in which the fracture started in the epiphysis, left the epiphysis, and went down the neck.

Referring to the case reported by himself, Dr. Blanchard asked whether there was a time when we could say to a patient we could do osteotomy, correct the adduction deformity, and assure him that another operation would not be required to correct another deformity which might occur from the further progress of the disease? Could we at any given time safely say to the patient when we operated, that this was the only operation that would be necessary?

SUBPHRENIC ABSCESS.

DR. DANIEL N. EISENDRATH presented a patient upon whom he had operated for right-sided subphrenic abscess following appendicitis, with the following history:

Patient, an Italian, had been operated upon for an appendiceal abscess one year previously by some surgeon whose name he was unable to learn. The patient was admitted to the service of Dr. Eisendrath at Cook County Hospital, on September 19, 1905, with

a history of having had a severe pain in the epigastrium for one week. His temperature, upon admission, was 103° . There was an area of dullness extending almost transversely around the chest from the level of the fourth rib downwards, merging into the hepatic dullness. A needle was inserted in the post-axillary line in the sixth interspace, and fetid pus obtained. The sixth rib was resected in the post-axillary line, but the pleural cavity found empty. This operation was performed by one of the house surgeons under local anesthesia. When the case was first seen by Dr. Eisendrath, the patient had been having a high temperature for five days, so that a second thoracotomy was undertaken in the anterior axillary line, a portion of the eighth rib being removed, and an encapsulated empyema was found lying between the inferior surface of the right lobe of the lung and the upper surface of the diaphragm, the so-called diaphragmatic empyema. It was thought that this second operation would prove sufficient, but following it the patient's temperature continued to rise and he having become septic, a third resection was deemed advisable. This third operation was performed by resecting a portion of the tenth rib in the anterior axillary line, when a large subphrenic abscess containing about a pint of very fetid pus was opened. Following this drainage the patient made a rapid recovery.

The case was undoubtedly one of subphrenic abscess complicated by an encapsulated diaphragmatic empyema, the etiology of which was in all probability due to the suppurative appendicitis of the previous year.

MACROGLOSSIA.

DR. EISENDRATH exhibited a boy of four, whose tongue at the time of birth was so large that it protruded from the mouth. When first seen, about six months prior to his presentation before the society, the case having been referred by Dr Nance, the tongue was very large and its surface covered with innumerable pinhead-sized and somewhat larger vesicles containing a clear fluid. In addition there were a great number of papillary projections composed of hyperplastic epithelium, resembling somewhat an ichthyosis hystrix of the skin in its appearance. The case showed a combination of the superficial or capillary and deeper or larger forms of lymphangioma.

The case was treated in a conservative manner by simply

cauterizing with the Paquelin cautery all of the superficial vesicles, instead of performing a radical extirpation of the entire lymphangiomatous area. The case had improved greatly since the time of the operation, and the tongue had become much smaller. He believed that this conservative treatment, the simple use of the cautery, was preferable in many cases to the risk of hemorrhage by resecting the diseased area.

DR. A. J. OCHSNER drew attention to a method which had been practiced by many surgeons of making a temporary ligature of the tongue by tranfixing it at its base with a needle, threaded with a double piece of silk, tied to each side, and then the portion which one desired to remove was excised, the vessels ligated, and the two sides sutured together, the stump finished, and the temporary ligatures removed, so that one could give the tongue any form desired without any risk whatever. It was a simple matter to do this. This treatment was rapid and satisfactory.

BRANCHIAL CYST.

DR. EISENDRATH also presented a patient from whom he had removed a right-sided branchial cyst about two months previously. When the patient first presented himself he had a soft, fluctuating swelling, located in the submaxillary region, over which the skin was freely movable, but it was attached firmly in its deeper parts. The patient was thirty-five years of age, and gave a history of having had the swelling for the past ten years, during which time it had been tapped a number of times. At the time of operation the cyst was found to be firmly adherent to the deeper structures. It had no connection with the pharynx. It was located in the angle between the upper end of the sterno-cleido-mastoid and the lower border of the lower jaw. It was about the size of an egg, and contained a yellowish turbid fluid, with cholesterin crystals. Microscopically, it showed a stratified epithelium corresponding to the mucous membrane of the pharynx as well as a number of mucous glands and lymphoid tissue, showing its origin had been from the pharyngeal end of the second branchial cleft.

FRACTURE OF THE UPPER END OF THE HUMERUS.

DR. EISENDRATH showed a patient with an impacted fracture of the neck of the humerus. The patient fell on the outstretched

hand. When first seen there was inability to use the shoulder, but no external deformity. There was slight crepitation, which was probably due to the fact that the impaction was an imperfect one. The exact nature of the injury was not determined until an X-ray examination had been made. This showed that the lower fragment had become impacted into the upper seat of the fracture, corresponding with the surgical neck of the humerus.

He had been unable to find any reference in books to this variety of fracture, with the exception of Hoffa's, in which a similar fracture was illustrated.

He demonstrated the use of moulded plaster-of-paris splints in connection with fracture of the humerus.

ADVANCED RAYNAUD'S DISEASE.

DR. EISENDRATH exhibited a case of advanced Raynaud's disease, in which amputation of one toe on the right foot and three toes on the left foot had become necessary on account of gangrene. The remaining toes still showed the bluish discoloration characteristic of this disease. The internal treatment had been of little avail to prevent the onset of gangrene. The patient had received nitroglycerine, 1/100 of a grain, three times daily, with a view to dilating the peripheral arteries several months while under the treatment of Dr. A. D. Kohn, by whom the case had been referred. This remedy had been combined with the application of a rubber constrictor, but both of these had but little influence in diminishing the pain or preventing the onset of gangrene.

He thought it was of great importance to recognize these cases early, both in the fingers and toes, the characteristic feature being a bluish discoloration which became more intense when the parts were exposed to the air.

"ISCHEMIC ATROPHY, CONTRACTURES AND PARALYSIS."

DR. ALEXANDER HUGH FERGUSON read a paper with the above title (for which see page 598).

DR. A. J. OCHSNER said that there was one point in connection with the subject of this paper which was under-estimated, and that was the possibility of producing tendons from almost nothing, tendons which would be useful to the patient. The worst

case he had observed, and he had seen many in which it was possible to produce tendons, was one in which the hand of a brakeman was caught between the bumpers of freight cars, sepsis ensued, and the extensor tendons were removed during the treatment of the septic condition. The patient came without any extensor tendons of his right hand. The ends were found the surface laid open, and artificial tendons were produced by means of chromicized catgut, varying in length from ten to fifteen centimeters. The man was willing to undergo this experiment without any promise of success. The man was still in the employment of the railroad company, and had a useful hand. The action secured in Dr. Ferguson's case by splicing the tendons was not surprising, and it made us more hopeful in tendon surgery.

BOOK REVIEWS.

SURGICAL DIAGNOSIS: A MANUAL FOR STUDENTS AND PRACTITIONERS. By ALBERT A. BERG, M. D., Adjunct Attending Surgeon to Mt. Sinai Hospital, New York. Illustrated with 215 engravings and 21 plates. Lea Brothers & Co. 1905.

In this book the author has departed from the conventional and stereotyped manual of surgery. He has blazed a new way in the maze of surgical facts and has presented them in a terse and lucid style to the student of surgery. Preceding the consideration of the diagnosis of each ailment, there is prefaced an epitome of the salient signs, symptoms and gross pathology of the malady. The methods of diagnosis as presented can no longer be called clinical in a classical sense, for the author is ever leaning on the crutch of the pathological laboratory on the one hand and the big stick of X-ray on the other to support an otherwise crippled clinical diagnosis. This is best exemplified in the teaching that the correct diagnosis of tumors of the breast commonly calls for exploratory incision and the use of the microscope, and the advocacy of the X-ray as a *sine qua non* for the diagnosis of fractures. In the matter of cystoscopy the author's enthusiasm has carried him too far when he gives the warm support to the teachings of Fenwick that ureteric meatoscopy alone offers pictures that are pathognomonic of the maimed and derelict kidney. The absence of any discussion on cystitis is commendable, for this disease is no entity; it is an end result of other pathological conditions.

The illustrations are very numerous and great thoughtfulness has been displayed to strictly conform to the text in the selection of them. They are borrowed for the most part and duly credited.

For several decades the greatest advances of surgery were

dependent on bacteriology, but the practical uses of the cryoscope, the esophagoscope, the sigmoidoscope, the hemoglobinometer and even the elicitation of new symptoms, as Head's Zones, McEwens signs and *commotio thoracis* (Perthe's disease), discussed in these pages, clearly point to the need of a sound training in physics for the physician and surgeon alike to keep abreast of the progress of surgery.

The subject is treated of in six parts. Part I refers to general considerations on diagnosis in three chapters, respectively devoted to the methods of diagnosis, clinical significance of general symptoms in surgical diseases, and surgical infections. A regional consideration of the injuries and diseases of the head and neck, thorax, abdomen and extremities comprises the contents of the remaining five parts.

MARTIN W. WARE.

DISEASES OF THE SKIN. By JAMES NEVINS HYDE, A.M., M.D., of Chicago, and FRANK HUGH MONTGOMERY, M.D., of Chicago. Seventh and revised edition. Lea Brothers & Co., Philadelphia and New York. 1904.

This work is a practical treatise on diseases of the skin for the use of students and practitioners. It is liberally and well illustrated. The plates in colors and monochrome are not especially good.

Most of the illustrations are from actual photographs and are well printed on heavy paper, giving to the reader a fairly accurate idea of the appearance of the disease.

The first part of the book is devoted to the anatomy and physiology of the skin and the general symptomatology, etiology, pathology, diagnosis, and therapeutics of diseases of the skin. The second part takes up in detail the disorders of the glands, inflammations, hemorrhages, hypertrophies, atrophies, new growths, sensory dermatoneuroses, and parasitic affections.

The important subjects of the technique and value in diseases

of the skin of both the Finsen light and the X-rays have been fully considered, not only in a special chapter, but also in connection with the treatment of the various disorders in which these measures have proved useful.

The work is in its seventh edition and has been carefully revised.

PAUL M. PILCHER.

GYNECOLOGY: MEDICAL AND SURGICAL OUTLINES FOR STUDENTS AND PRACTITIONERS. By HENRY J. GARRIGUES, A.M., M.D., of New York. J. B. Lippincott Co., Philadelphia and London. 1905.

The present work should not be confused with the Text-book of Diseases of Women by the same author which was published in 1900, nor with his Text-book of the Science and Art of Obstetrics published in 1902.

This volume is written especially for students in medical colleges and such general practitioners who desire to make themselves acquainted with the essentials of modern gynecology. It is but an outline, or guide to beginners, describing in detail the minor operations, and setting forth only the chief features of the major operations.

The most valuable part of the book is the general division which treats of the methods of investigation and examination of the patient and treatment in general. The special division which treats of the various departments of gynecology in detail, while complete as a guide to beginners, still is quite elementary and reflects the individuality of the author.

PAUL M. PILCHER.

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ORIGINAL MEMOIRS.

RESECTION OF PORTION OF THE CHEST WALL AND OF THE DIAPHRAGM, FOR PRIMARY SARCOMA OF THE PLEURA.

(From the Surgical Department of the Prince Galitzin Hospital.)

BY DR. S. DERUGINSKY,

OF MOSCOW, RUSSIA.

ON July 1, 1904, was admitted to the Surgical Department of the Prince Galitzin Hospital, a woman twenty years of age, having a tumor situated in the left wall of the thorax in the axillary line below the left nipple. She dated her illness from the previous April, when she first began to be troubled with violent shooting pain in her left side. Upon examination of the side upon the appearance of the pain she then first noticed under the skin a small tumor, of the size of a hazel-nut; this gradually increased in size thereafter until, at the time of her entrance into the hospital, its dimensions were 7 by 8 cm. Her general appearance was that of health.

When admitted, on the lower part of the left half of the thorax, posterior to the mammillary line, there was a soft tumor of spherical shape, fluctuating, without definite limit, its structure fading into the surrounding tissues. It seemed to be adherent to the eighth and ninth ribs. The skin over the tumor was normal and movable; no enlarged veins; no perceptible enlarged glands in the axilla; all internal organs normal; pulse ranging from 80 to 90.

On July 3, under chloroform narcosis, the growth was exposed. It presented the appearance of muscular tissue, in the centre of which was a cavity filled with blood. The capsule of the tumor was continuous with the muscles of the thoracic wall, part of which were removed with the growth. (Fig. 1.)

From the centre of the space left by the removal of the growth there was revealed an opening which led into the pleural cavity, on either side of which were the edges of the adjacent ribs, the eighth and ninth, which were eroded. The air was freely entering into the pleural cavity through this opening, which was now closed with a tampon of gauze.

The patient, in spite of the pneumothorax, breathed quietly, and her pulse was unaffected. It was now evident that the growth not only involved the parietal pleura, but also it was adherent to the diaphragm. After having opened widely the pleural cavity, it was possible to separate the tumor-mass from the diaphragm without cutting through the diaphragm. Neither infiltration nor nodular masses were visible on the dome of the diaphragm. A large gauze tampon was left in the pleural cavity, its end being brought out from the inferior angle of the wound. The greater part of the external wound was now sutured. The operation occupied about one hour. At its close the patient had developed marked shock, so that an infusion of saline solution was administered.

During the first hours after the operation the patient was groaning and turning about in her bed, but without dyspnoea. Gradually good reaction was established. The temperature gradually rose and in the evening of the third day reached its maximum, 38.4 C. (101.5 F.); respirations, 24; pulse, 120, of good quality. On the fifth day the intrapleural tampon was removed. No entrance of air into the pleural cavity followed this removal, and the wound was left without further tamponing. The healing of the wound progressed well thereafter, the patient having a normal temperature, good appetite and a sense of general well-being. On the eighth day primary union had taken place in the wound, and all sutures were removed. On the fourteenth day she was walking about the ward, the wound completely healed excepting at the point where the tampon had been inserted, where there was still a granulating surface. Auscultation revealed an



FIG. 1.—Primary sarcoma of pleura. Mass removed at first operation.



FIG. 2.—Part of wall of thorax and of diaphragm, removed at the second operation.

increasing expansion of the left lung. On the twentieth day she was discharged from the hospital in a good condition of health.

One month later, she noticed a thickening in the scar, but no pain, no cough; her general condition was apparently good. A gradual redevelopment of unmistakable sarcoma in the cicatrix followed but not until the lapse of four months did she return to the hospital.

In the meantime, the growth had extended greatly over the inferior portion of the left thorax, and by its involvement of the intercostal nerves was provoking great pain. Her general nutrition was still good. On the left wall of the thorax, in the region of the operation scar, sarcomatous nodes were visible, extending from the inferior axillary line downward to the space between the eighth and ninth ribs. The tumor had developed especially along the scar, where it had formed a thick mass with many protuberances, measuring fifteen centimetres in diameter. The skin was bluish, with many dilated veins, and closely adherent to the sarcomatous mass. There were no enlarged glands under the clavicle nor in the axilla or neck; no cough; respiration was deep and quiet. The respiratory murmur in the left lung was feebler than in the right, but could be heard all over the lung; the internal organs were all in good condition.

On November 2 the following operation was done: All the superficial nodes were first removed, when it became evident that they extended not only on the muscles of the thorax, but also on those of the abdomen as far as to the anterior superior spine of the ilium. Then the pleural cavity was again opened by the removal of all the inferior portion of the left thoracic wall from the seventh to the eleventh rib, together with a portion of the diaphragm which was covered with sarcomatous nodes. (Fig. 2.)

Upon opening the pleural cavity, the left lung immediately collapsed, and at the bottom of the cavity there could be seen the rhythmical contractions of the heart. Again the thoracic cavity was filled with a gauze tampon. Threatening heart failure at this moment developed, although the respiration was regular. An infusion of 500 cubic centimetres of saline solution, supplemented by hypodermic injections of camphorated oil and caffeine, overcame this tendency to collapse.

Before resecting the diaphragm it was carefully separated

from the peritoneum. At this moment the patient had a retching which caused the peritoneum to protrude into the pleural cavity like a bladder, while above it the heart was hanging temporarily deprived of its support. The projecting peritoneum was pushed back and held by the hand of an assistant until all the visible diaphragmatic disease had been removed. To the surface of the cut muscles from which the sarcomatous nodes had been removed, both of the thoracic wall and abdominal region, the Paquelin cautery was now applied, after which the cut edge of the diaphragm was sutured to the seventh rib, whereby the thoracic cavity was separated from the abdominal. Every bleeding vessel was carefully ligated; into the inferior angle of the wound a tampon was inserted; the external wound was closed by sutures. The operation occupied seventy-five minutes.

At its close, the patient was in marked shock, but breathed freely. Good reaction was gradually established; the respiration remained quiet, but the patient suffered much from vomiting, which continued for three days, exhausting her. Pulse, 105; respirations, 24; temperature, varying from 37.1 to 37.5 (99-100 F.).

On the fourth day after operation, temperature having risen to 38.3, the superficial dressing was changed; on the seventh day the tampons were removed. The patient had begun to complain of dyspnœa which was not relieved by the removal of the tampons. Temperature 39.2 in the evening, 38.8 in the morning; pulse 120. The eleventh day dyspnœa continued, and a redness along the suture line was noticeable. An exploratory puncture of the pleural cavity was made; neither air nor fluid was found within the cavity, but a stitch abscess along the suture line was opened. Most of the wound had healed primarily. The temperature fell thereafter, gradually, until at the end of one week it had become normal and dyspnœa had disappeared. The patient began to eat, and recovered noticeably her interest in her surroundings. The left lung expanded but the respiration within it was accompanied by some moist râles. The record of November 29 stated that the patient was feeling well, had no dyspnœa, was beginning to sit up in bed; the wound healed except at the site of the abscess.

On December 2, however, she began to complain of pain in

the scar, and two days thereafter a considerable node had developed in the middle of the scar, which two days later was removed and the surface underneath it seared by the actual cautery; some cough, with bloody sputum, followed the narcosis. Temperature rose again to 37.7 and 38.8, with crepitation in the lungs marking a patchy pneumonia. After ten days she again began to feel better and the temperature fell to normal.

December 19 a new sarcomatous node was appreciable near the lower angle of the scar, which was at once removed under local anæsthesia, and the base cauterized. Three days later, a third node appeared at the cut end of the ribs. All further interference was now abandoned.

At the first operation I had removed an encapsulated tumor, flat, ovoid, of soft consistence, and measuring ten centimetres in vertical diameter, nine centimetres transversely and three and one half centimetres anteroposteriorly. The capsule of this tumor was formed by the parietal pleura. The surface of the capsule turned to the lung did not present any deviation from normal in appearance, except thickening. At the point where the capsule of the tumor was adherent to the diaphragm, the remains of muscular fibres are clearly seen, arranged obliquely upon the tumor. On the surface of that portion which emerged between the ribs, the remains of the destroyed ribs and muscle are visible. The cyst-like cavity within the growth, at the time of the first operation, was filled with blood and sarcomatous detritus.

At this first operation we removed portions of several muscles, the serratus magnus and intercostal muscles, together with pieces of the eighth and ninth ribs. At the second operation was removed an enormous sarcomatous growth, with a portion of the scar left by the first operation, and much skin adherent to the growth. This mass weighed 220 grammes, was eighteen centimetres in length, nine in width and five in thickness. The mass consisted principally of exceedingly soft, friable, pigmented material. Microscopical examination showed the pigmentation to be the result of interstitial hemorrhages.

This growth was limited to the subcutaneous fat layer, and the muscular stratum, and did not extend through the pleura. The weight of the entire mass of tissue removed at this operation amounted to 620 grammes.

At this second operation, by an incision which began at the xyphoid process in front, the lower part of the left half of the thoracic wall, including the cartilaginous arch and parts of the eighth, ninth, tenth and eleventh ribs, were removed together with parts of the abdominal muscles which were infiltrated with sarcomatous nodes, and a portion of the musculature of the diaphragm. Microscopical examination showed the tumor to be composed exclusively of round sarcoma cells, with but little stroma; abundant blood-vessels and lymphatics.

Primary sarcoma of the pleura is rare. The principal interest, in my opinion, attaching to this case, is in the removal of so large a part of the wall of the thoracic cavity, and the extension of the operation to the diaphragm. Heretofore, even the wounding of the diaphragm has been considered as a serious occurrence; but, in the present case, it was detached from its normal point of insertion and was brought up to the lower half of the thorax, in spite of which there was not observed in this patient any derangement of respiration, either at the moment of the operation or during the first days following.

The dyspnoea which appeared on the fifth day after the second operation seemed to be due to the formation of an abscess and to inflammatory phenomena in the adjacent pleura. It is noteworthy, also, that in this patient there was an absence of any dangerous crisis from pneumothorax, a condition which every physician is apprehensive of if he has to invade the pleural cavity in an operation, in the absence of preëxisting pleural adhesions. It will be remembered that to obviate this danger, Sauerbruch, under Mikulicz's direction, devised for such operations a particular chamber by means of which there was secured negative pressure of air, amounting to between 12 and 16 mm. of mercury, thanks to which he had, in a

dog, at one séance, performed extensive resection of the thoracic wall on both sides; had incised the œsophagus, and opened the pericardial and mediastinal cavities. The dog bore the operation well, but died two days after. At the autopsy, Sauerbruch demonstrated that neither of the lungs was collapsed.

In another similarly conducted operation upon a dog, Sauerbruch removed two-thirds of one lung, and the dog breathed quietly throughout the operation.

I will not enumerate other proposals which have recently been made for preventing the dangers from pneumothorax. I content myself simply with communicating the experiences in the present case as to their bearing on the dangers of operative pneumothorax, as well as their bearing upon the possibilities of surgical interference with the diaphragm. As far as I am aware, from search through the literature, so considerable a resection of the diaphragm as was done in the second operation performed in this case had been done but once before. Gorohoff has reported in the "Transactions of the Society of Russian Physicians in Moscow," for 1901, the case of a child, aged five years, in which he operated for the removal of an enormous sarcoma of the abdominal wall and the left half of the thorax, with recovery.

In my own case the fatal end was not long delayed. The sarcoma rapidly extended in the site of the scar and in the skin adjacent thereto, pressing upon the left lung, with metastases in the left breast. Death by asthenia occurred January 16, following.

The autopsy demonstrated that, on the left side, the diaphragmatic curtain between the thorax and the abdomen had been entirely restored, the edge of the diaphragm having become adherent where sutured to the lower border of the seventh rib. The left lung was adherent to the parietal pleura, and was stuffed with sarcomatous nodes. The removed diaphragm showed that about two-thirds of the diaphragm had been taken away.

OBSERVATIONS ON THE DIAGNOSIS AND TREATMENT OF TYPHOID PERFORATION.¹

BY GEORGE WOOLSEY, M.D.,

OF NEW YORK,

Surgeon to Bellevue Hospital ; Associate Visiting Surgeon to the Presbyterian Hospital.

WHEN we consider the fact that perforation occurs in 2.5 to 3 per cent. of all cases of typhoid, and that fully one-third of the mortality of the disease is due to this cause, the importance of the surgical treatment of this complication, by which approximately 25 per cent. of cases are saved, is evident at once.

In accordance with the above it is estimated that something like 25,000 die annually from typhoid perforation, one-quarter of whom might be saved if promptly operated upon. Osler¹ says that during the first 10 years of the Johns Hopkins Hospital nearly one-third of the mortality of typhoid was due to perforation, and that since then this proportion has increased owing to the striking reduction of the death-rate of the toxæmic group.

As to the mortality of these cases subjected to surgical operation, Harte and Ashhurst,² in a paper read in 1903, collected 362 cases with a mortality of 74.03 per cent. Doubtless this is a little too low if all the cases operated upon could be included, for unsuccessful cases are often not reported except in connection with successful cases.

The result of surgical operation in typhoid perforation has doubtless improved in recent years. This improvement depends largely on two factors, an early diagnosis, with a correspondingly early operation, and improvements in the technique. In some of the cases operated upon I have been im-

¹ Read before the New York Surgical Society, February 28, 1906.

pressed with the advanced stage of the peritonitis in comparison with the supposed time since perforation. It is true that it is a well-established fact that peritonitis may occur without actual perforation. G. G. Davis³ and E. G. Cutler and J. W. Elliot⁴ have reported operations for peritonitis during typhoid where no perforation and no other cause of the peritonitis was found save in the latter case a deep ulceration about ready to perforate. It is quite likely that the peritonitis in not a few cases operated on after perforation may have commenced before the actual perforation.

All are agreed that an operation as soon as possible after perforation, which depends upon an early diagnosis, is most essential to the best results. The fact that the results in cases operated upon long after perforation has occurred have been surprisingly good is not incompatible with the importance of early operation. In the statistical tables of Harte and Ashhurst² 55 cases were operated on over 36 hours after perforation with a mortality of 67.2 per cent., a lower mortality than in those operated on at any earlier period. This is readily explained by the fact that patients surviving the perforation so long have a milder infection or the process has been slow enough to permit a combative reaction or a limitation of the process. My own experience is limited to 6 cases operated on in the Presbyterian Hospital and 1 case in private practice. In addition I have collected the remaining cases, 11 in number, operated on in the Presbyterian Hospital in the last 10 years, comprising all the cases operated on for typhoid perforation according to the records, in order to study the symptoms which have led to the diagnosis of perforation.

Although medical men are more alert than ever to make the diagnosis of perforation, the difficulties have not materially diminished except in so far as they are more ready to advise exploratory operation when perforation is suspected. As Osler¹ has said, what we need is a fuller knowledge of the symptoms of perforation apart from those of the consecutive peritonitis, which is what is usually diagnosed.

It is at the end of the second week and in the third week that we are to be on the look out, and from then on, even throughout convalescence. The average period of the disease at which perforation occurred in my group of 17 hospital cases was the twenty-seventh day of the disease.

We are to bear in mind the greater probability of perforation in severe cases and in those with distention or hæmorrhage, and that it is not uncommon in walking typhoid. In 4 of the 17 cases in the table there had been previous hæmorrhage; in at least 1 case distention had been a marked feature; but in the majority of cases the previous course had been that of a typical typhoid and not unusually severe.

Having, then, a certain period and certain types of cases in which we are to be especially on the outlook for signs of perforation, what are these signs or symptoms? I have divided the symptoms present in each case into two groups, the initial symptoms and those subsequently developed, the latter depending on the consecutive peritonitis.

There is only one symptom that has been nearly uniformly present in all the cases on the list, and that is abdominal pain, usually coming on suddenly and generally severe. It was present in 15 out of 17 cases, and slight pain was present in another case. It is usually complained of in the lower half of the abdomen and most often on the right side. In the one remaining case it is distinctly stated that there was no pain, and here an apparently walled-off cavity containing fæcal matter and lymph was found on operation. In the case in which the pain was slight there was no perforation in the ileum but sloughing areas in the sigmoid, with perforation.

Tenderness was the next most common symptom, being noted in 7 cases in the early stages and in 5 others subsequently. Rigidity was only mentioned in 4 cases at the outset but developed in 9 others before operation. Perhaps the percentage of cases showing tenderness and rigidity as initial symptoms is lower than in the experience of most others, but these are symptoms of peritonitis, and the most reliable ones, rather than of the perforation itself.

The complaint of sudden severe abdominal pain is noted by writers on the subject as a "reliable and constant symptom" (F. T. Stewart⁵), "the note of alarm," (Armstrong⁶), "the most valuable sign," (McCrae & Mitchell⁷), and one that should "always lead to the suspicion of perforation and beginning peritoneal infection" (Shattuck, Warren and Fraser⁸).

To be sure, as pointed out by Stewart,⁵ pain is a frequent symptom in uncomplicated cases of typhoid, tenderness is common over the ileum and slight rigidity may be present. But the sudden onset of severe pain in the right lower quadrant or the lower half of the abdomen in a case of typhoid should create a very strong suspicion of perforation. If in a short time tenderness and rigidity are associated with it we should not wait for further indications but advise operation at once. If we have any symptom of the perforation itself it is the severe pain of sudden onset, and if this merely indicates commencing peritonitis it is the best early symptom that we have.

I agree with Harte² that rigidity is a most valuable sign; but that "it is never wanting except in patients with unusually large and pendulous abdomens" I can not agree. In at least two cases on the list its absence was noted and in one case (No. 14), in spite of the absence of liver dulness, its absence at my first examination led me to delay operation and thus miss the most favorable time to operate. Since that experience I would not wait for the presence of rigidity before making the diagnosis of perforation or advising operation. Rigidity and tenderness are our most valuable signs of peritonitis and are not always present until this is well established. In typhoid the sensorium seems to be so blunted that they are not present as certainly or as early as in cases of appendicitis.

Vomiting was present in 4 cases as one of the initial symptoms, often in consequence of the severe abdominal pain, but in one case without any pain or other symptom but weakness (Case IX). Vomiting was present in 7 other cases among stage but was slight in one case and had been constantly present in the other.

An initial fall of temperature was not noted in any case. As Osler¹ says, "The time-honored picture of perforation must be erased." It was present as a late symptom in 2 cases, indicating collapse due to peritonitic absorption. Murphy⁹ rightly lays great stress on the point that there is little depression immediately after the perforation of the intestine and no collapse, and that the latter is a late symptom and the expression of absorption of infective material. It is an unfavorable symptom. Early collapse is more a symptom of hæmorrhage than of perforation, both of which may occur together.

Among the late symptoms more or less distention or tympanites was noted in 13 cases, dulness in the flanks in 4, diminution or absence of abdominal breathing in 5, and of the liver dulness in 5. The loss or lessening of liver dulness with a flat belly may be pathognomonic of intestinal perforation, but it is a late and variable symptom as a rule. The leucocyte count was not of much assistance. It was high (over 12,000) in 3 cases and somewhat high for typhoid in 4 (7700, 7900, 8000, 9200), but in one of the latter it had been 12,000 six days before. In others it remained low.

Rise of temperature, pulse and respiration was the rule; in some cases the temperature became high.

The late symptoms confirm the diagnosis but we should endeavor to operate before these symptoms develop.

We need nothing more than the characteristic pain, tenderness in a fixed spot, and rigidity, to indicate an immediate operation, and we need not require both the tenderness and rigidity to be present before proceeding to an exploratory operation. The latter is quite safe, far safer than a fatal delay, and one may perhaps anticipate perforation and, by infolding the intestine over the sloughy base of an ulcer, prevent it. In one case during the past summer, having recently had the experience above referred to, when, owing to the absence of rigidity and marked tenderness, I delayed operation when perforation existed, I did an exploratory operation when

there was merely a strong suspicion of perforation on the part of the medical staff. The patient at the end of the second week of the disease complained of sudden severe abdominal pain and considerable tenderness in the right lower quadrant, and there was diminished abdominal respiration. No rigidity or other symptoms were present. On operation no perforation and no peritonitis was found. As a result of an appendectomy and salpingectomy done four years before there were several bands of adhesions, binding the ileum into the pelvis, which were freed. One of these was adherent to the ileum at the situation of an ulcerated Peyer's patch and, together with the neighboring intestine, was quite congested. After operation the patient was free from the pain and tenderness and made an uninterrupted convalescence. In another such case operated on by Dr. F. Tilden Brown last summer no perforation was found and the temperature fell to normal the next day and continued so. I have explored through an incision under cocaine anæsthesia and found no free gas, fluid or other signs of peritonitis and hence excluded perforation. In such cases one can exhaust a sterilized catheter passed to the bottom of the pelvis to determine the absence or character of free fluid.

In connection with the operation itself there are several points as to which opinion and practice among different surgeons vary to some extent. Firstly, as to anæsthesia. I much prefer general anæsthesia. These cases take gas and ether well, and the latter is a heart stimulant. In my first two cases at the Presbyterian Hospital I used cocaine anæsthesia. The incision is painless and the procedure is satisfactory for the purpose of exploration to determine whether free fluid or other signs of perforation or peritonitis are present. But retraction of the edges and the necessary handling of the inflamed intestines are painful and this together with the realization of being subjected to operation, in spite of a blunted sensibility, causes more shock than the same operation under general anæsthesia. Most surgeons now prefer general anæsthesia but others, such as Cushing,¹⁰ and Hays¹¹ operate mostly under cocaine anæ-

thesia. If cocaine is used a few whiffs of chloroform may be advantageously given when the peritoneal cavity is opened.

As the lower three feet of the ileum is by far the most frequent site for the perforation,—in 95.5 per cent. according to Haggard,¹² while according to Harte ² 73 per cent. were in the lower twelve inches,—the incision should be placed so as to readily expose this part. I prefer the incision through the right rectus, as the lower end of this allows better drainage of the pelvis than the right oblique incision which is preferred by some. Owing to the fact that in cases at the time of operation there is as a rule more or less free fluid, often of a foul odor, and some intestinal contents extravasated, the best method of getting rid of this is important. My personal preference is for irrigation with a large amount of hot normal saline solution through a large Chamberlain tube. In these cases there are seldom many if any adhesions and all parts of the peritoneal cavity may be irrigated and cleansed with the least possible traumatism. Furthermore the hot saline is an effective stimulant. In the table of hospital cases irrigation was used in 14, not mentioned in 2 and not used in 1. In the last named only the area about the perforation was cleansed with the salt solution, and though operated on about 2 hours after the perforation, in relatively good condition, the patient died with symptoms of peritonitis less than 36 hours after operation. Whether the occurrence of peritonitis would have been avoided by irrigation no one can say. Some surgeons do not irrigate. Thus of 7 cases reported by McCrae and Mitchell,⁷ as operated on at the Johns Hopkins Hospital, irrigation was employed in only one case.

Anderson,¹³ believing that the cause of death after operation for typhoid perforation is toxæmia from the contents of the paralyzed bowel, recommends that the ileum be emptied of its contents and the bowel itself irrigated through the perforation and through special incisions. He has used this method in 9 cases with satisfactory results. The chief objection to this procedure lies in the time required, as it is generally agreed that a short operation and an early operation are two of the essential requirements for success.

Drainage is almost always used. In one successful case of Dr. F. T. Brown's (see table) drainage was omitted but there was little or no free fluid. The method of drainage varies greatly. After irrigation I use a large rubber tube split down the side, with a core of gauze, or else a large cigarette drain introduced well down into the pelvis. According to the experiments of F. T. Murphy,¹⁴ the latter is walled off earlier; the tube, therefore, drains the general peritoneal cavity for a longer time. Then with the head of the bed raised very high, in the high Fowler position, gravity assists all free fluid into the pelvis from which it is drained away.

In the table of 17 hospital cases 4 recovered, a mortality of 76.4 per cent. Of my own 6 hospital cases 2 recovered, a mortality of 66.6 per cent., or, including one previous case operated on in private for septic peritonitis of origin unknown to the two eminent consultants who saw the case three hours previously, a mortality of 71.4 per cent.

Of the cases which died, my first case died on the table while infusion was being given. Operation had been made possible only by a clysis given just before. Fifty-two hours was the longest that any fatal case survived the operation.

The time between perforation and operation varied from 2 to 30 hours, and averaged 10.3 hours in the 15 in which it is mentioned. The day of the disease on which perforation occurred varied from the tenth to the sixty-sixth and averaged the twenty-seventh day. Three were in the second week, 5 in the third, 1 in the fourth and 7 at a later period. Of those that recovered one was shown to the N. Y. Surgical Society by me in December, 1905. My other successful case subsequently developed Pott's disease of the spine. As to his convalescence, his temperature first reached normal 19 days after operation and a week later he had what appeared to be a relapse for 12 or 13 days. Sixteen days after operation he developed a faecal fistula through the sinus left by the drains. This fistula closed in 3 weeks. Whether this came from the sutured perforation

or a second perforation, cannot be definitely stated. Cases where a second perforation has occurred subsequently have been nearly uniformly fatal.

In connection with the cases that recovered it may be of interest to call attention to the fact that the ages were 9, 13, 17, and 23. The percentage of recovery in cases of children from 6 to 15 years is about twice that of adults. These cases developed in the tenth, forty-fourth, sixty-sixth and twenty-ninth day of the disease respectively. The cases developing on the forty-fourth and sixty-sixth day of the disease were in a relapse, and such cases as well as those occurring in convalescence give a more favorable prognosis.

The last case I operated on deserves especial mention on account of the unusual site of the perforation, *i.e.*, in the sigmoid colon. This patient, M. B., 20 years old, had run a fairly typical typhoid course with considerable abdominal distention throughout when, on the morning of the twenty-fifth day, the day of the perforation, she passed a few small blood-clots through the rectal tube. The pain at the time of perforation was not very acute and was referred, with the tenderness, to the left lower quadrant. There was no rigidity. The incision was made in the median line on account of the symptoms and no perforation was found in the ileum after careful search. On examining the large intestine a good sized irregular necrotic area was found in the sigmoid with a perforation on either side. This was inverted with two rows of Lembert sutures with some difficulty, owing to the friable condition of the surrounding parts. She died 18 hours after operation. On post-mortem the sigmoid for 6 or 8 inches in the vicinity of the perforation presented a worm-eaten appearance of the mucosa, the edges of the ulcerations not being undermined. At two other points perforation appeared imminent. The perforated area was gangrenous.

In the tables of Hare and Ashhurst among 190 cases the large intestine was involved only 7 times, and among these 7 the sigmoid only once. The prognosis is worse in cases of perforation of the large intestine and they have been overlooked and only found on autopsy.

In conclusion, without summarizing all the facts of importance, I would emphasize (1) the value of severe pain of sudden onset in the lower half of the abdomen as an early sign of perforation and its increased value as an indication for operation when associated with localized tenderness and rigidity; (2) the importance of exploratory operations in case of doubt in view of the good results which follow if no perforation is found and of the earlier period at which the operation is done if perforation is present.

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TABLE OF CASES OPERATED ON AT THE PRESBYTERIAN HOSPITAL.

No.	Name and Age.	Date.	Operator.	Day of Disease.	Previous Course of Disease.	First Symptoms of Perforation.	Subsequent Symptoms of Perforation.	Time of Oper'n after Perf'n.	Operation.	Irrigation.	Drainage.	Result.
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1	M.D. 25	Sep. 8, 1900	Woolsey.	42 In Relapse. (?)	28th day. Temperature normal, then rose, continued high. Widal pos. 22d day.	Abdominal pain and tenderness. Mass size of finger in right iliac fossa. Rigidity not mentioned.	Vomiting. Free peristalsis. Hiccough. Pulse imperceptible. Clusis given before operation.	13 hrs.	Cocaine. Med. incision. Turoid serum. Perf. $\frac{3}{4}$ " in diam., 5" from cæcum; 2 rows Lembert sutures. Retraction of wound and handling gut painful.	Yes	Cigarette.	Died while infusion being given on table
2	C.H. 24	Oct. 11, 1900	Hawkes.	10 Ordinary typhoid.	Diarrhœa. Severe abdominal pain.	After some hours increasing distention, tenderness and rigidity. Hiccough, vomiting. Temp. 103° to 99°. L. C. 7,000 to 12,000 to 15,200.		39 hrs.	Through R. rectus. Yellow fluid, faecal odor. Perf. 12" from cæcum. Tissue $\frac{3}{4}$ " around excised; 2 layers Lembert sutures.	Yes	Rubber tube. Four strips of gauze.	Died in 5-6 hrs.
3	V.S. 18	Feb. 17, 1901	McCosh.	31 Ordinary; 2 hæmorrhages 20 and 2 days before.	Sudden abdominal pain. Vomiting in 2 hours.	Increasing rigidity, distention and tympany. Slight shifting dullness in flanks. Liver dullness lost. Double friction rub Rt. Cost. margin.		9 $\frac{3}{4}$ hrs.	Cocaine. R. intermuscular incision. A little chloroform. Foul green fluid. Perf. $\frac{3}{8}$ " diam., 8" from cæcum. Three tiers Lembert sutures.	Yes	Glass. Several strips of gauze	Died in 32 hrs.
4	E.J.F. 24	July 26, 1901	Woolsey.	15 Entered hosp. as appendicitis 15 days ago. Widal pos. Hæm. yesterday.	Severe constant abdominal pain and tenderness.	Vomiting. Distention. Abdomen soft. L. C. 8,000 (12,000 6 days ago).		14 hrs.	Cocaine. Med. incision. Large amount purulent serum. Perf. 2" from cæcum. Lembert sutures.	Yes	3 Cigarette.	Died in 8 $\frac{1}{4}$ hrs.
5	A.S. 21	Aug. 3, 1902	Brown.	36 Ordinary course. Widal positive.	Severe pain in cæcal region, disappeared with ice bag, returned more severe.	Tenderness, rigidity, retraction and then slight distention. Vomiting. Temperature returned.		20 hrs.	Chlorof. Med. incision. Foul yellow fluid; 3 perforations in ileum sutured.	Yes	Vaginal.	Died in 28 hrs.
6	K.M. 23	Sep. 6, 1902	Brown.	29 Ordinary. Widal positive 14th day. Numerous hæmorrhages	Very severe pain in Rt. lower quadrant. No rigidity or tympany.	Dullness over lower abdomen. Temp. and pulse rose. Rigidity and tympany began to appear. L. C. 3,600.		7 hrs.	Gas and ether. Intermuscular incision. Adherent omentum nearly closed minute perforation.	?	No drainage.	Recovery.

7	M.B. 23	July 26, 1902	Brown.	40	Ordinary typhoid.	Sudden pain, tenderness and rigidity in Rt. iliac fossa.	Liver dulness 11" high. No abdominal respiration. Rigidity and tenderness increased. L. C. 6,200.	4½ hrs.	Chloroform. Rt. rectus incision. Free fluid, no gas. Perf. ¾" in diameter sutured.	Yes	Cigarette.	Died in 14 hrs.
8	H.M. 9	Sep. 23, 1903	Woolsey.	10	In bed only 1 week. Had solid food. Brought to hospital with peritonitis. Diag. appendicitis.	Abdominal pain and tenderness.	Some rigidity, tenderness and tympanites. Diminished peristalsis and abdominal respiration.	?	Gas and ether. Rt. intermuscular incision. Appendix normal removed. Fulcrum sutured. Perf. in lower 18" in ileum. Purse string and row of Lembert sutures. Thinned patch inverted.	Yes	Large cigarette to pelvis and R. iliac fossa.	Recovery. On 10th day fecal lapse. Later Pott's disease of spine.
9	B.B.	Oct. 21, 1903	McCosh.	About 21	Typical.	Vomiting, inability to hold anything on the stomach. Weakness. No pain.	Distention, slight rigidity in Rt. lower quadrant.	?	Chloroform. Incision through R. rectus. Perf. in lower ileum. Silk Lembert sutures. Apparently walled off cavity containing fecal matter, lymph, etc.	?	Cigarette.	Died in 25 hrs
10	E.M. 54	Nov. 6, 1903	McWilliams.	Sick some days.	Brought to hospital with symptoms of peritonitis.	Intense abdominal pain.	No abdominal respiration. Distention. Movable dulness in flanks. General tenderness.	?	Gas and ether. Med. incision. Foul serum. Perf. 16" fr. caecum. Purse string suture.	Yes	2 Cigarette.	Died in 25 hrs.
11	W.J.K. 21	Sep. 22, 1904	Hawkes.	15	Ordinary typhoid.	Severe abdominal pain. Rigidity in lower abdomen.	Temperature rose to 106°. Vomiting. Typical signs of peritonitis.	6 hrs.	Gas and ether. Med. incision. Free gas and serum. Perf. 18" from caecum. Two layers of Lembert sutures.	Yes	3 Cigarette.	Died in 6 hrs.
12	M.M. 19	Sep. 30, 1904	Hawkes.	20	Considerable abdominal pain.	Sudden severe pain in Rt. iliac fossa, with tenderness and rigidity.	Vomiting. Hiccough. Liver dulness diminished. L. C. 7,900.	4 hrs.	Gas and ether. Med. incision. A little gas and foul fluid. Perf. ¾" diam., 12" from caecum. Two layers of Lembert sutures.	Yes	2 Cigarette.	Died in 52 hrs.
13	W.C. 17	July 28, 1905	Woolsey.	66 34th day of relapse	Original fever 8 days. Normal 19 days. Relapse severe. Widal pos. 2d week of relapse.	Sudden pain in Rt. lower quadrant. Marked tenderness below umbilicus.	Temp. 105° (from 101°). L. C. 7,700. Rigidity below umbilicus. Tympanites. Slight shifting dulness. Abdominal respiration absent in lower half.	6 hrs.	Gas and ether. R. rectus incision. Foul greenish fluid. Perf. ¾" diam., 15" from caecum. Two rows of Lembert sutures. Omentum adherent to gut at ulcerated patch above.	Yes	Large rubber tube with gauze core to pelvis. High Fowler position.	Recovery. Relapse very long, followed by another relapse.

TABLE OF CASES OPERATED ON AT THE PRESBYTERIAN HOSPITAL—Continued.

No.	Name and Age.	Date.	Operator.	Day of Disease.	Previous Course of Disease.	First Symptoms of Perforation.	Subsequent Symptoms of Perforation.	Time of Operation after Perforation.	Operation.	Irrigation.	Drainage.	Result.
14	E.S. 25	Aug. 19, 1905	Woolsey.	14	4 weeks ago heat prostration negative. L. C. 16th, 13-600; 19th, 17-300.	Sudden abdominal pain, disappeared and then returned. Abdomen a little distended but soft.	First seen by me after emesis, when symptoms temporarily relieved. Later slight rigidity and distention. Temperature fell to 99°. Liver dulness absent.	24 hrs.	Gas and ether. R. rectus incision. Gas and free fluid. Perforation 8" in diameter in lower 18" of ileum. Purse string and row of Lembert sutures.	Yes	Large cigarette drain.	Died in 14 hrs.
15	M.B. 20	Sep. 15, 1905	Woolsey.	25	Typical. Widal positive. Distended all along. L. C. 6700. Blood through rectal tube, Sep. 15, a. m.	Some pain in left lower quadrant. Distention and rise of temperature.	Vomiting. Temp. 105°. Pulse 140. Distention tenderness below and to left of umbilicus. Pain not severe. No rigidity. Liver dulness normal.	4½ hrs.	Ether. Med. incision. Gas and some free fluid. No perforation in sigmoid ileum. In sigmoid good sized irregular area necrotic. Perforation on either side inverted with two rows of Lembert sutures; very friable.	Yes	Rubber tube, gauze core, and large cigarette drain.	Died in 18 hrs.
16	G.H. 21	Dec. 19, 1905	Eliot.	18	Typical.	Sudden severe pain and chill, nausea and vomiting.	Temp. rose 102° to 103°. L. C. 11,400 to 12,300. Abdomen tender, rigid, slight distention. Liver dulness diminished.	2 hrs.	Gas and ether. R. rectus incision. Free gas and 8 oz. free fluid. Perforation 8" from caecum. Purse string and one row of Lembert sutures.	No, only local cleansing.	Large cigarette.	Died.
17	E.G.	Jan. 14, 1906	Hawkes.	44 In Relapse.	Typical. Widal positive. L. C. 8,700. Distended for 3 days.	Sudden severe pain in R. L. Q., with some local tenderness and rigidity.	4 hrs. later distention. Rigidity and tenderness especially in R. iliac region. Some dulness in both flanks. Abdominal resp. diminished. L. C. 9,200. Temp. rose to 104°.	5 hrs.	Ether. R. Intermuscular incision. Free fluid, no odor. Pinhole perforation 8" from caecum. Purse string and Lembert sutures.	Yes	Cigarette drain.	Recovery.

COMBINED OPERATION FOR THE REMOVAL OF THE APPENDIX AND THE CURE OF RIGHT INGUINAL HERNIA.¹

BY FRANZ TOREK, M.D.,

OF NEW YORK.

Attending Surgeon to the New York Skin and Cancer Hospital; Adjunct Professor
of Surgery in the New York Post Graduate Medical School; Assistant
Visiting Surgeon to the German Hospital

HAVING had a number of patients upon whom I had to operate both for chronic appendicitis and right inguinal hernia, the two operations being performed at different times, it occurred to me that it would be in the patient's interest to combine the two operations in one if possible. On one occasion, where I had a large hernial opening, I attempted to bring down the appendix into the hernial opening, a procedure which suggested itself through the fact that the appendix is occasionally found in a hernial sac. The attempt, however, proved to be an absolute failure. Thereupon I devised the operation following. It consists simply in extending the skin incision somewhat higher up than usual for hernia operations, in dividing the fascia of the external oblique about at the usual place for the gridiron operation for appendicitis, but extending it downward into the external inguinal ring, and then completing the operations for hernia and for appendicitis in the usual way.

To describe the operation more in detail, it is performed as follows: An imaginary line is drawn from the anterior superior spine of the ilium to the umbilicus. A point on this line at a distance equal to one quarter of its length from the iliac spine marks the beginning of the incision, which is carried down from here to the external inguinal ring. The aponeurosis of the

¹Read before the Surgical Section of the New York Academy of Medicine, March 2, 1906.

external oblique is exposed throughout the length of the incision. This fascia is now incised in the direction of its fibres, as is customary in the gridiron operation for appendicitis, exposing the internal oblique muscle; but the incision is prolonged downward so as to terminate at the apex of the external inguinal ring. The aponeurosis of the external oblique is prepared off from the underlying parts in the usual manner, on the outer side exposing Poupart's ligament. Then the hernia operation is proceeded with up to the point where the sac is cut off. Here the hernia operation is intermitted and attention turned to the appendix. The fibres of the internal oblique and transversalis are separated bluntly in the usual manner, the peritoneum is opened, the appendix removed; then the peritoneum, transversalis fascia, and muscles are closed again; in a word, the appendicitis operation is completed, except that the aponeurosis of the external oblique is still left open.

We now return again to the hernia operation and suture the internal oblique and transversalis to Poupart's ligament according to any of the approved methods, and finally suture the aponeurosis of the external oblique in the entire extent of its incision, so as to close both the appendicitis and the hernia operation. Lastly, the skin is sutured.

One might ask why, after incising the aponeurosis of the external oblique, one should not first perform the appendicectomy and then do the hernia operation? This seems to me to be less advisable, because in operating on the hernia a considerable amount of traction is apt to be made on the sac, and this traction may invalidate the suture by which the peritoneum was closed over the appendicitis operation, whereas, on the other hand, if the sac is closed first and the appendicitis operation performed next, there is so little traction on the peritoneum during the latter operation that it will not interfere with the soundness of the closure of the neck of the sac.

Again, it might appear strange to some why, after closing the sac, we should turn our attention to the appendix, instead

of at once putting in the sutures to unite the internal oblique and transversalis muscles to Poupart's ligament. The answer is, that this latter suture is a very delicate one, owing to the fact that the sutures embrace muscular tissue and that, during the efforts at bringing the appendix to the surface, the abdominal muscles may be subjected to rather extensive manipulation during which the muscle fibres could easily be injured where they had been sutured to Poupart's ligament.

The combined operation has decided advantages over the performance of the two operations at separate sittings. It saves the patient one operation and it takes only very little longer than the hernia operation alone would require, for, after the aponeurosis of the external oblique has been laid open so widely, the appendicitis operation is performed more easily, and therefore more rapidly, than where the usual short incision through the aponeurosis is made. Furthermore the combined operation will have a claim to greater firmness of the abdominal wall, as it is certainly better to have one incision in the aponeurosis than two. It goes without saying, that in those exceptional cases where the diseased appendix is situated within the hernial sac, the method described above is not needed.

APPENDICULAR FEMORAL HERNIA, WITH NOTES OF ONE HUNDRED CASES.¹

BY ALFRED C. WOOD, M.D.,
OF PHILADELPHIA.

Assistant Professor of Surgery in the University of Pennsylvania; Surgeon to the University, Philadelphia, and St. Timothy's Hospitals.

IN the summer of 1900 the writer operated upon a woman, about 70 years of age, for a painful, fluctuating swelling in the right groin which was supposed to be a suppurating inguinal adenitis. (See Case 99.)

The incision revealed a cavity, containing a small, offensive, gangrenous mass, which proved to be the vermiform appendix. The cavity was found to be the sac of a femoral hernia. The distal half of the appendix was gangrenous; the proximal portion was nearly normal. This was a case of gangrenous appendicitis occurring in the sac of a femoral hernia. Although this case excited a deep interest, no investigation of the subject was undertaken at the time.

In August, 1904, I saw, in consultation, a woman who had a lump in the right groin, which had been present for three weeks. The diagnosis of femoral hernia had been made by her physicians, an opinion in which I fully concurred. (See Case 100.)

At the operation, the swelling was found to consist chiefly of serum, but the sac also contained the entire appendix vermiformis, the base of which was so tightly grasped at the neck of the sac that reduction was impossible until the constriction had been divided.

Although this is a rare condition, I have been able to collect 100 cases, including these two personal experiences, in which the appendix alone occupied the sac of a femoral hernia.

¹ Read before the Philadelphia Academy of Surgery, April, 1905.

All those in which any other portion of the intestine was reported as being present, have been excluded. While an effort was made to include every case, some, undoubtedly, have been overlooked.

It would be a difficult task to determine who first noted the presence of the vermiform process in the sac of an external hernia. Such observations, however, are not confined to recent times, having been recorded by Garengéot (*Traité des opérations de Chir.*, 1731, i, 237), and by Sandifort towards the end of the eighteenth century. Tritschler wrote on hernia of the cæcum and appendix in 1806. Rust described (*Handbuch der Chir.*, 1832) hernia appendicularis. Among other contributors to this subject are Klein (1886); Brieger (1893); Bajardi (1895); Spurrier and Corner (1902); Vesignie (1903), and Wassiljew (1904).

In addition to the papers devoted to a more or less formal discussion of the subject, there are a large number of individual cases recorded. This is especially true with reference to "cæcal" hernia, in connection with which the appendix is often found. Hernia of the appendix occurs in both the inguinal and femoral varieties, and either alone or in conjunction with other portions of the abdominal viscera.

The following figures show the relative frequency of the appendix in abdominal hernias: Of 250 cases of radical cure of hernia by the Bassini method, reported by Hoffman, from the Albert Clinic, Vienna, the appendix was found in the sac 9 times. Of 1586 hernias operated upon in the clinic of Professor Colzi, Florence, the appendix was present in 27. Wassiljew reports 106 Bassini operations, in which the appendix was found 3 times. Coley met with the appendix, alone or with other viscera, 16 times in 1003 operations for the radical cure of hernia. Bundschuh (Heidelberg clinic) met with the appendix 3 times in 109 consecutive operations for strangulated femoral hernia. Combining these figures, the appendix was found 58 times in 3054 hernias,—once in about 53 cases. No figures are at hand to show the proportion of hernias in which the appendix alone is found in hernial sacs.

The relative frequency of pure appendicular inguinal and femoral hernias might be expected to preserve about the same ratio as that which exists between the usual forms of these two varieties, but the few figures at hand lead to a rather different conclusion. In Brieger's collection of 35 cases of hernia of the appendix, 20 were inguinal (19 right and 1 left), and 15 were femoral. In 98 cases, Bajardi found 54 inguinal and 44 femoral. Of 145 hernias containing the appendix alone and with other viscera collected by Spurrier and Corner, 71 were inguinal and 69 femoral.

In Gibbon's collection of 63 "cæcal hernias," 56 were inguinal and 7 were femoral. Of the latter, 4 (3 right and 1 left) contained in addition to the appendix, other portions of the bowel, while 3 (all right) contained the appendix only. Of the 56 inguinal hernias, 32 (28 right and 4 left) contained intestine in addition to the appendix, and in 9 (8 right and 1 left) the appendix alone was found. It will be observed that the appendix was present in all the femoral hernias, but was absent in 15 of the inguinal hernias. In this collection of "cæcal" hernias the ratio of the femoral to the inguinal variety is as 1 to 8; of pure "appendicular" hernia it is 1 to 3; in Spurrier and Corner's, it is about equal. In Brieger's collection (appendicular) it is 3 to 4; in Bajardi's (also appendicular) it is 4 to 5. It must be borne in mind that different collections of cases do not always lead to the same deductions, but as far as these limited figures may be accepted, they show that cæcal hernia is about 8 times as frequent in the inguinal variety as in the femoral, while in pure appendicular hernia, the proportion is nearly equal.

Another interesting point concerns the relative frequency of cæcal and appendicular hernia in the two sexes. Of Gibbon's 56 cases of inguinal hernia, but one occurred in a woman, and that was a pure appendicular hernia; therefore the table does not contain a single example of inguinal "cæcal" hernia in the female. The seven cases of femoral hernia all occurred in women. Spurrier and Corner's cases include only those in

which the appendix in a hernial sac gave rise to at least a part of the symptoms. Including both the inguinal and the femoral varieties, there were 52 males and 61 females.

Of the 100 cases of appendicular femoral hernia appended to this paper, 81 were in women, and 7 in men; the sex not being given in 12.

An important difference between cæcal and pure appendicular hernias concerns the age of the patients. Gibbon quotes the combined experience of Coley and Halsted (1898), a total of 642 herniotomies, in which the cæcum or appendix was found in the sac 21 times, and in but 3 of these was the patient over 15 years of age. It should be stated that 16 (but 1 being over 15 years of age) of these were reported by Coley, whose work has been largely among children. Of Gibbon's 63 cases, 36 were under 15 years of age, 5 between 15 and 40, 7 between 40 and 50, and 15 past 50 years. Over one-half, therefore, were less than 15 years of age, and 60 per cent. were under 40.

In marked contrast are the cases of appendicular hernia here reported. The age is given in 77 instances. The youngest patient was 19 years of age, five were in the third decade, five in the fourth, twenty-five in the fifth, eighteen in the sixth, thirteen in the seventh, nine in the eighth, and one in the ninth; the latter patient being aged 87 years. More than one-half of the patients were over 50 years of age, and over 85 per cent. were past 40 years. This varies slightly from the statement made by Spurrier and Corner, that the maximum frequency occurs in the sixth decade, although this refers to cases accompanied by intestine in the hernia.

Any consideration of the etiology of appendicular hernia must first admit a low position and a definite degree of mobility of the cæcum and appendix. Given these conditions, the subsequent steps will probably be determined by the attending circumstances. It is certain that all do not develop in the same way. From a study of the appended cases, it seems permissible to assume the following types:

1. The hernia (probably cæcum and appendix) develops in

the usual manner,—*i. e.*, it is either congenital, or a freely movable cæcum and appendix is situated low down, in contact with a weak internal abdominal ring, when some severe strain or jar, or a series of such accidents, develops the rupture. The hernia is at first reducible, and usually returns to the abdomen when the patient is in the recumbent position. If the hernia is not kept up by a truss, sooner or later the appendix becomes adherent to the sac. In this condition the hernia is but partially reducible, the bowel escaping from the abdomen to the hernial sac and returning, according to the position of the individual, while the appendix remains fixed. In these cases the patient frequently notes that “the lump gets smaller on lying down, but does not entirely disappear.” Either as a result of wearing a truss, or of contraction of the neck of the sac from natural causes, the cæcum may cease to descend, leaving the appendix as the sole structure involved in the protrusion. The neck of the sac may continue to contract, causing incarceration or strangulation of the appendix, or the latter may become the seat of inflammation. In either of these conditions, acute symptoms develop promptly.

2. It is conceivable that a congenital hernia, or one occurring early in life, may appear to have cured,—that is, may cease to come down, but yet leave a sac and small, but patulous canal in which the appendix could engage under favorable circumstances. In some of the cases the abdominal symptoms,—pain, constipation, and vomiting,—indicating incarceration or strangulation of the appendix, occurred before the hernia was observed; in others the lump appeared some days or even weeks before the onset of acute symptoms. In either event, it would appear that there must have been a hernial sac present, or the appendix could not have escaped so freely and suddenly from the abdomen.

3. One is led to ask if a hernia is ever appendiceal primarily? The history of some of the cases appears to justify an affirmative reply (*vide* Cases 4 and 82). Whether an incomplete hernia exists, which suddenly becomes complete; or

whether the appendix, lying either in the inguinal or femoral fossa, is suddenly and forcibly protruded through the respective canal, carrying the adjacent parietal peritoneum before it, must probably remain a matter of conjecture. The writer believes the former is the more reasonable explanation.

The symptoms of appendicular femoral hernia as noted in the following cases, vary greatly: A lump was present in the groin in every instance. In some it had existed previously; in others, it first appeared with the onset of acute symptoms for which the operation was performed. An impulse on coughing was rarely noted at the time of onset of the acute symptoms. In a number of cases the lump was the only symptom, but the majority exhibited in addition one or more of the following: Fever, loss of appetite, nausea, vomiting, in some cases stercoraceous, constipation, colicky pains, violent hypogastric pain, distention, frequent and difficult micturition, drawing sensation in lower part of the abdomen, pain in the right hip joint, restricted movement of the thigh, and flexion of the thigh.

It seems worthy of mention that involvement of the appendix alone, in some instances, gave rise to symptoms characteristic of strangulated intestinal hernia,—*e.g.*, nausea, vomiting (even stercoraceous), constipation, and distention. This is evidently the result of reflex nerve action, as it is improbable that any organic obstruction is caused by the incarceration of the appendix. An unexpected manifestation was flexion, and restricted movement of the thigh. This condition is probably due to contraction of the appendix after it has become adherent to the sac, so that full extension of the thigh would make undue traction on the cæcum.

The duration of the acute symptoms was stated in 50 of the cases. It varied from a few hours to five weeks. The majority was less than three days; and three-fourths, five days or under. Of the more frequent symptoms, nausea is noted eleven times, vomiting twenty-five times, and constipation fifteen times.

The condition of the appendix was said to be normal, or nearly so (mere congestions included) in eleven, inflamed in four, adherent in seventeen, incarcerated in twenty-two, strangulated in eighteen, perforated in sixteen, ulcerated in five, gangrenous in twenty. It will be understood that two or more of these conditions were sometimes noted in the same case.

In 52 instances the appendix was removed; of these, three died. In 17, the appendix was reduced; all recovered but one. There were 8 other fatal cases, but in these the disposition of the appendix is not given.

In his work on appendicitis, page 186, Sonnenburg says he does not accept the view that a "normal" appendix becomes strangulated. The latter condition, in his opinion, is always due to inflammation. Wulff takes the opposite view, claiming, in his case, that the appendix was perfectly normal except for the constriction and its results. I believe the weight of the argument is against Sonnenburg. Some difference of opinion may arise from the rather confusing and sometimes indiscriminate manner in which the terms "incarceration" and "strangulation" are employed. But as the second condition is simply an advanced stage of the first, no sharp distinction need be drawn in the present discussion.

One may well imagine a small hernial orifice barely large enough to admit the appendix into which the latter may become engaged during some violent effort of the individual. Owing to the dependent position and perhaps the pressure of organs above, the circulation of the appendix is somewhat embarrassed, and slight swelling ensues. This causes a little constriction at the neck of the sac, and still greater swelling results, each condition aggravating the other. In the presence of marked congestions, as is well known, inflammation of the appendix is easily established. In this way the inflammatory cases are explained. It is equally obvious that an appendix in the sac of a hernia may become inflamed from other causes, resulting in swelling and subsequent strangulation.

That it is unsafe to assume that every case of incarcerated or strangulated appendix is inflamed, appears from a reference to the cases. In 17 instances the appendix was returned to the abdomen, and but one death followed. This was reported by Dieffenbach in 1848. In this case the appendix was clearly not in a condition suitable for reduction. If the naked-eye appearances may be trusted, the appendix was normal in a number of instances; it is also significant that no trouble resulted in the 16 cases in which reduction was performed. Surely some of them would have given symptoms if they had been returned to the abdomen in an inflamed condition.

There appears to be no sign by which appendicular hernias may be recognized. In my first case the conditions suggested an abscess; in the second, the sac was so tense that no information as to its contents could be obtained. Coley has been able to recognize the appendix in the hernial sac by palpation, but this would manifestly be possible in but a few of the cases. Usually tension, fluid or inflammation would interfere with this test. Both Koelliker and Muus are of the opinion that the presence of the appendix in the hernial sac causes the patient to walk with the body inclined forward, and that this posture is an important aid in making the diagnosis. This symptom can be explained only by assuming that the appendix is adherent to the sac and that when the patient attempts to take the full, erect attitude, traction is transmitted from the mesocolon, through the cæcum, to the appendix. This condition was noted in a few instances, but so infrequently that it cannot be looked upon as a symptom, except in those cases in which adhesions, incarceration, or strangulation exists. It is not probable, therefore, that many of these cases will be recognized before operation.

The treatment of hernias in general is divided into the palliative and the radical, and the appendicular hernia if recognized would be treated upon the same lines as the other forms.

The proper disposition of the appendix, when found at operation in the sac of a hernia, must be decided by a consideration of both the general and local conditions.

In discussing treatment, the cases may roughly be divided into three classes:

First.—Those in which the appendix is normal or but slightly congested from mild constriction. In this class, removal of the appendix is to be preferred, if the attending conditions are favorable; that is, if the entire process and its attachment to the cæcum can be exposed in the wound, rendering the operation easy, and free from risk to the patient. This is much more apt to be the case in inguinal than in femoral hernias. When the base of the appendix cannot be exposed, the hernial canal may be enlarged by a small incision, if the patient's general condition justifies prolonging the operation. (See Case 99.) Cases will be met with in which this additional interference will be contraindicated, as in Case 99. In such instances, the appendix may safely be returned, if in a normal condition, as pointed out above. In older subjects the danger of subsequent appendicitis is much less than it is before middle life. A radical cure should be attempted whether the appendix be returned to the abdomen or removed.

Second.—Cases in which the appendix is firmly adherent to the sac, or is the seat of distinct inflammation. In these instances the organ must be removed, as the danger of returning it would be greater than the risk attending its removal. Great care is necessary, in the highly inflammatory cases, to avoid infecting the peritoneal cavity. A radical cure should conclude the operation, unless the amount of infection present demands free drainage.

Third.—Cases in which the appendix has perforated and fecal matter has escaped into the sac, or in which an abscess has formed. In this class the greatest nicety of judgment and precision of operative technique will be required to deal effectively with the conditions and yet avoid infecting the peritoneum. When the distal portion only is involved, it may be possible to ligate at the base and remove the affected part. In the particularly bad cases the sac should be laid open widely and sponged out carefully; the appendix should then be drawn out

as far as possible and held in this position by sutures. In this way, the abdominal cavity is shut off. Of course, this presupposes that the peritoneum has not already become infected. In these cases the external wound must not be sutured, but should be allowed to heal by granulation. In many instances the wound will heal leaving the cæcum adherent at the internal hernial orifice, which, as a rule, will cause no inconvenience; or a fecal fistula may remain, which can be closed by operation at an appropriate time subsequently.

A study of the cases that follow will show that:

1. Appendicular hernia is more frequent than has been supposed.

2. When occurring in conjunction with the cæcum, no special considerations may be involved; but when occupying the sac alone new problems of treatment are introduced.

3. The appendix is more apt to be found in femoral than inguinal hernias. It has occasionally been observed on the left side.

4. A herniated appendix is apt to become adherent and inflamed, and, as a matter of clinical experience, this danger appears to be greater when it occupies the sac alone than when it is accompanied by other portions of the intestine.

5. The diagnosis of appendicular hernia has not been made, as a rule, before operation.

6. In all cases operated upon it is desirable to remove the appendix unless the patient's general condition or safety contra-indicates this course.

REFERENCES.

1. ALY (Münch. Med. Woch., 1898, 45, 1656) reports a case in which the vermiform appendix had a perforation at its apex. The entire appendix was found in the sac of a femoral hernia. Result not stated.

2. ANNANDALE (Lancet, London, March 30, 1889, page 627). Mrs. M., aged 60 years, noticed a swelling in right groin twenty years before, but it gave no trouble. Thirteen days ago the swelling increased in size, became tender, and caused a little fever. Soothing applications were applied. A diffuse inflammatory swelling was present in right groin and all signs of diffuse suppuration; some nausea, but no obstruction. Operation: Free incision, keeping in view history of hernia. Cavity, not markedly circumscribed, contained pus and blood. Well-defined round

tumor, size of a mandarin orange, exposed. This proved to be sac of a femoral hernia; walls much thickened by inflammation. Sac opened; pus and blood flowed out. Only other object was appendix, thickened and congested. Base firmly adherent to inner aspect of neck of sac, and thoroughly plugged it. Base of sac and appendix firmly ligatured with catgut and cut away. Base of stump sutured by two or three subcutaneous sutures as in radical cure. Wound soundly healed January 19.

Appendix removed measured three and a-half inches. Small perforation about one inch from tip.

3. BAJARDI (*Lo Sperimentale*, 1895, 330) reports the case of a woman of 42, with a right femoral hernia and the phenomena of incarceration and inflammation. Herniotomy was performed; the sac was found to be one mass of exudate, in the midst of which was an adherent appendix. This was excised, the sac sutured, and drainage inserted. The patient recovered.

4. BARTH (*Deut. Zeit. f. Chir.* 1902, 149) reports the case of a woman of 80, who had been suddenly taken with pain in the upper part of the right thigh while lifting a heavy load. There were nausea, loss of appetite, vomiting, absolute constipation, and inability to pass flatus; also colicky pains, especially in the lower part of the abdomen. Eight days after the appearance of these symptoms, a diagnosis of incarcerated femoral hernia was made. At that time the mass was the size of a pigeon's egg. The skin was slightly movable and not reddened. The tumor was hard, and swollen lymph-glands surrounded it. Palpation was painful. There was some distention of the abdomen. The patient had never suffered with a rupture before. The operation was performed on the eighth day, under Schleich's anæsthesia, and some swollen lymph-glands were removed. Upon opening the hernial sac, turbid fluid escaped. The only structure in the sac was a loop of the vermiform appendix, 10 cm. long, gangrenous, and much distended. The incarceration was so tight that it was difficult to pass a probe alongside of the appendix. There were no adhesions except in the neighborhood of the internal ring. By breaking these up, a small abscess, containing foul-smelling green pus, was opened. The appendix was amputated. The resected appendix was 16 cm. long, 10 of which were incarcerated. The patient died some weeks later, of senility.

5. BATTLE (*Lancet*, 1899, 1, 1223). Woman, aged 59; swelling in right groin for five years. It caused some difficulty at one time, which subsided in three weeks. Ten days ago it reappeared without apparent reason. Pain, no vomiting, no constipation, mass irreducible, pressure in right iliac fossa caused sensation of dragging on swelling, no fluctuation. Operation: Some inflamed glands; appendix in sac. Appendix and adherent sac removed. Recovery.

6. BAYER (*Centralbl. f. Chir.*, 1876, vol. xxxi, page 689). Appendix strangulated in right femoral sac. Local pain and swelling. (Quoted by *Eccles*.)

7. BAYER (*Prag. med. Woch.*, 1886, xi, 221) reports the case of a woman of 27 years, who complained of having had a small mass in the

right groin for several weeks. Its origin was unknown. There was pain radiating along the right limb and the right side of the abdomen. The patient was able to pass gas and stools. She could not move the right leg as freely as usual; the mass enlarged gradually. A diagnosis of hernia was made. The hernia was irreducible and inflamed. An incision was made over the mass, and the hernial sac was found to contain bloody, serous fluid. The hernial contents consisted of fibrin and a small piece of intestine, circularly constricted at the hernial neck. The loop was the size of the little finger, and not movable. The crural ring was split, the adhesions severed, and the loop of intestine found to be a small portion of the vermiform appendix. This was reduced, and the patient recovered. The wound was permitted to granulate.

8. BENDER (Bull. et Mem. de la Soc. Anatom. de Paris, 1900, vol. lxxv, 756). The patient was a woman, with a tumor the size of a nut on the inner side of the right thigh. It was hard, painful, and dull on percussion. There was no impulse on coughing. A diagnosis of inguinal adenitis was made; hernia being excluded by the absence of impulse.

Suddenly, violent abdominal pain was felt, followed by distention and absolute constipation. The diagnosis of strangulated femoral hernia was then made, and operation performed. The sac contained a quantity of yellowish fluid and the appendix. The latter, which was ligated and removed, measured 12 cm. In the tip a little pus was found. The patient recovered.

9. BENNET (Med. and Surg. Reporter, Phila., 1882, vol. 47, 396). Man, aged 64 years; lump in right groin for three years. On February 9, 1881, violent pains in hypogastrium. Called physician, who found lump size of hen's egg in right groin. Not painful; felt like large glands. Supposed to be hernia.

Taxis, laxatives, enema, etc., all ineffectual, but latter caused pain. Vomiting set in and became stercoraceous on 11th. Operation on 12th: Free end of appendix in *gangrenous* condition in femoral hernia. Patient recovered.

10. BIDWELL (Trans. Clin. Soc. 1897, xxx, 186). Woman, aged 50; reducible right femoral hernia for seven years; for past fourteen days it was irreducible; no symptoms of strangulation. The hernia was tense, the size of a hen's egg, and slightly tender. Hernial sac contained clear fluid, one and a half inches of normal appendix in the sac; reduction, radical operation. Recovery.

11. IBID. Woman, aged 60; right femoral hernia for five weeks; came down suddenly; irreducible, tense, hernial sac size of hen's egg; contained clear fluid. One inch of normal vermiform in sac; reduction; radical operation. Recovery.

12. BRIANCON (Thèse de Paris, 1897). Woman, aged 42; an irreducible, incarcerated, painful right femoral hernia, developed suddenly. At operation the sac was found to contain an ulcerated appendix. The patient recovered.

13. IBID. Woman, aged 45 years; had a right femoral hernia for two

years, which suddenly became incarcerated. At operation the hernial sac was found to contain an incarcerated appendix, 15 cm. long. It was obliterated below the point of incarceration. The appendix was removed. The patient recovered.

14. *IBID.* A woman had had a right femoral hernia for a few years. Symptoms of strangulation developed suddenly. At operation the inflamed appendix was found in the hernial sac. Appendectomy. The patient recovered.

15. *BRIEGER* (*Archiv f. klin. Chir.*, 1893, xlv, 892) reports the following case: A woman had pain, with frequent and difficult micturition. In the right groin there was a mass the size of a walnut. The skin was not changed. The operation showed within the hernial sac a cord $2\frac{1}{2}$ cm. long. When pulled out, this was found to be the vermiform appendix. It was removed, and the patient recovered. It was somewhat thickened and pale-red. The amount of constriction was very slight.

16. *BROHLE* (*Münch. med. Woch.*, 1887, xxxiv, 506) reports the case of a woman of 72 years, who had had a small hernia of the right femoral region for several years. It had always been irreducible. It was as large as a hen's egg and painful to touch. Incision over the mass evacuated ill-smelling pus. The pus came from glands that had broken down. One of the glands was attached to a string, which passed through the femoral canal and seemed to be continuous into the peritoneal cavity. The hernial sac was opened and the string was found to be the vermiform appendix. It was adherent to a gland. It could be torn, and from its interior, foul-smelling pus was evacuated. The appendix was removed and the stump reduced. The patient died 23 days later.

17. *BRUNNER* (*Beitr. z. klin. Chir.*, 1889, iv, 18) reports the case of a woman of 59, who complained of having had colicky pains for six years. The cause of these was not known. They came, as a rule, suddenly, remained several hours, and disappeared after she had vomited a quantity of bile. She had had for the same length of time a tumor of the size of a walnut over the upper part of the right thigh. It was not completely reducible. When seen by the author, she had had for two days intense pain associated with bilious vomiting. The small mass was swollen and not very tender. The skin over it was red and infiltrated. Through the skin there could be felt a cord passing upward into the abdomen. A diagnosis of suppurating, incarcerated femoral hernia was made. Incision over the mass revealed, after cutting through some strictures, a space lined with a greenish membrane. A fecal odor arose from it. Along the mass the finger entered the abdominal cavity. The mass was found to have an opening the size of a pea, through which fecal masses were escaping. Close examination showed it to be the vermiform appendix. It was removed and the hernial opening was packed. The patient died.

18. *BUNDSCHUH* (*Beitr. z. klin. Chir.*, 1901, xxxi, 425) reports the case of a woman of 53, who had had a right femoral rupture since childhood. While lifting a heavy tub, she experienced pain in the groin. The hernia

was incarcerated for eight days. She vomited once, and there was inability to reduce the hernia. Herniotomy and a radical operation were performed. The hernial sac was thickened; the vermiform appendix was adherent to the upper part of the hernial sac; the lymph-glands were adherent; and there was some omentum, which was replaced. The patient recovered.

19. *IBID.* In the second case, the patient was a woman of 60, who had had a right femoral hernia for two years. She had suffered much from coughing. While carrying a heavy bucket, incarceration took place. There was violent pain and nausea, and a mass the size of a nut appeared. The incarceration lasted three days. Herniotomy and resection of the adherent vermiform appendix, which was 6 cm. long, were performed; also a radical operation. The hernial fluid was turbid. Some hemorrhagic omentum was resected, and the patient recovered.

20. *CABARET* (*Jour. des connaissances medico-chirurgicales*, 1842, x, 54) reports the case of a woman of 60, who, without any known cause, began to vomit and had colic. There was no history of any hernia. The abdomen was tender and tense, and the next day a right-sided femoral hernia suddenly appeared and could not be reduced. It was the size of a pigeon's egg, and very sensitive. The hernial sac was opened, and in it was found the appendix, which was three fingers' breadth long, swollen reddish-brown, and strangulated. The strangulation was produced by the femoral ring. Gimbernat's ligament was cut through, and the appendix was reduced. The patient recovered.

21. *CRUVEILHIER* (*Anat. pathologique*, 1835, Liv., xxxvii, Planché 6) reports the case of a woman, 50 years of age, who had a fluctuating phlegmonous tumor of the right groin, the size of an orange. The skin over it was inflamed. An incision over the tumor evacuated a large quantity of very offensive pus. The intestine [appendix] was gangrenous. Improvement followed the operation, but the patient died two months later. Autopsy revealed the cæcum to be attached to the crural ring, in which the appendix was engaged. The latter was adherent to the posterior wall of the sac and was perforated near its apex.

22. *DANZEL* (*Zeit. der Aerzte zu Wien*, 1859, 209) reports the case of a woman of 61, who, for three days, had had symptoms of strangulation. The abdomen was distended; there was absolute constipation, and vomiting. Taxis had been performed for some time. The author found a large, right-sided femoral hernia, tensely distended and painful. The skin was reddened. An incision over the region of the hernia revealed fetid pus. The cavity was drained and the patient put to bed. An improvement was noticeable within a few days. On the twelfth day, a grayish-black mass was removed from the wound in the course of dressing, and was found to be the vermiform appendix. In addition to this, small masses of fæces were discharged. The patient recovered with a small fecal fistula.

23. *DAVIES-COLLEY* (*Guy's Hospital Rep.*, 3d Series, vol. 27, 1884). Woman, aged 38 years, admitted to Guy's Hospital October 2, 1883; married; eight children, youngest two and a-half years. Twelve months

ago while lifting a heavy basket she felt a sudden pain in right groin, followed by vomiting. Symptoms soon subsided, but recurred from time to time. On a second occasion she felt a small lump in groin; always able to return lump, and pain never lasted over one hour. Sometimes the hernia would not come down for two or three months. September 30, in chapel, 6 P.M., sudden attack of pain, and felt lump in groin; on arriving home unable to return lump as before. Vomiting at 9 P.M., and continued next day. Taxis, evening of October 1, unsuccessful. Taxis applied unsuccessfully a second time. Bowels moved on 30th, twice October 1, and once (slightly) on 2d.

Swelling over right femoral ring, globular, one to one and a quarter inches in each direction. Rather movable; no impulse on coughing. Thought to be gland, or strangulation of omentum, or part of calibre of bowel.

Sac was incised. Appendix found, coiled up, three inches long, normal thickness, and little altered in appearance, except that there was a blood-clot under the peritoneal coat, one inch from tip. Internal border of femoral ring was notched, and the appendix returned. Sides of sac brought together with catgut and wire sutures in skin. No fluid or omentum in sac. Recovery.

24. *IBID* (page 436). Woman, aged 47 years, admitted to hospital, May 14, 1884. Married; fourteen children. Lately had a sensation of weakness over abdomen and chest.

December 24, 1883, after day's hard work, noticed a swelling in right groin which came down suddenly and caused great pain. Swelling reduced by doctor. No more trouble until May 9, when lump again appeared while she was walking and coughing; 11th, bowels opened and taxis applied twice; 13th, taxis again applied. Vomiting began. In the right groin below Poupart's ligament an ovoid swelling two inches in circumference. No impulse on coughing; abdomen tender. On opening what was thought to be sac, two ounces of serous fluid escaped. A knuckle appeared, and on scratching surface a second flow of fluid having fetor, but no color. In the sac was an object covered with gray lymph which proved to be the appendix. Appendix ligated at base and the swelling caused by inflammation. Recovery.

25. DIEFFENBACH (*Die operative Chir.*, 1848, ii, 600) reports the case of a man about 60 years of age, with no history of ever having had a rupture. He suddenly became ill. There was nausea, belching, and a drawing sensation in the lower part of the abdomen. The bowels were regular. The hernial region was free. By pressing over the right femoral ring, dull pain was elicited. Laxatives, leeches, and applications were used without improving the condition. Operation disclosed at the femoral ring a very small mass, the size of a small bean, protruding from the ring, and resembling peritoneum. The membrane was opened and was found to be connected with a blackish-gray, folded body. When loosened, this was seen to be the end of the vermiform appendix. It was

adherent. Gimbernat's ligament was cut through, and the appendix was reduced. The patient died.

26. ECCLES (St. Bartholomew's Hospital Reports, vol. xxxii, 1896). Woman, aged 48, hernia, right femoral, for eleven years. Admitted to hospital for an irreducible swelling in the right groin. No impulse on coughing, but fluctuation was present. Skin tender and inflamed. Patient never had vomiting, but was constipated.

Herniotomy: One inch of appendix, dark and thickened, was adherent to mouth of sac. Ligated and removed. The strangulation was due to the swelling caused by inflammation. Recovery.

27. IBID (Trans. Path. Soc., London, 1896-97) reports Gee's case. Man, aged 41 years, died from carcinoma of stomach. At postmortem the appendix was found to be five inches long; four inches within abdomen, and the distal inch in sac of right femoral hernia, adherent at its mouth, and the free extremity somewhat dilated. No previous history in the case.

28. FLOEL (Deut. Zeitschr. f. Chir., 1891, xxxii, 587) reports the case of a woman of 50, who was suddenly seized with violent pain in the upper part of the right thigh. The pain continued, and a small mass appeared. There was no vomiting. The mass was found to be a hernia, which was irreducible and incarcerated. It was tender to touch and the size of a pigeon's egg. The skin over it was not changed. An incarcerated crural hernia containing omentum was diagnosed. A longitudinal incision was made, and the mass rendered free on all sides. It was found to be continuous with a pedicle through the femoral canal. This pedicle entered the mass, the centre of which was found to be a hernial sac. The pedicle was found to be the vermiform appendix. It was incarcerated, was brownish-black, and had a fetid odor. No fluid escaped. The femoral canal was dilated; the appendix was removed. It was 6 cm. long and not perforated. The patient recovered.

29. GOOD (British Med. Journal, 1898, ii, 876). Woman, aged 39; tense swelling in right groin; existed for 24 hours; pain and vomiting. Diagnosis: Irreducible, strangulated, femoral hernia. Operation: Hernial sac opened; it continued the vermiform appendix, strangulated and congested; five inches of the process were in the sac and two inches in the abdominal cavity; one inch was gangrenous; this was resected. Patient recovered.

30. GUINARD (Bull. de la Soc. Anat. de Paris, 1896, lxxi, p. 451). Woman, aged 45 years, who had had a small femoral hernia, was suddenly seized with abdominal pain, and the hernia became irreducible. There were no symptoms of intestinal obstruction. Celiotomy was performed, and the appendix doubled upon itself was found to occupy the femoral canal and hernial sac. The proximal and distal extremities of the appendix remained in the abdominal cavity. The patient recovered.

31. HEUSINGER (Mag. f. d. Gesamnte Heilk., 1820; quoted by Bajardi) reports the case of a man complaining of colicky pain that had come on suddenly. The patient died four days later. At the

autopsy, a suppurative peritonitis was found in the crural canal; the vermiform appendix was discovered, adherent and surrounded with a mass of pus.

32. HEVIN (*Cours de Path. et de Therap. chirurgicale*, 1785, p. 407) reports a case of right femoral hernia with symptoms of incarceration. The femoral sac opened and pus with a fecal odor escaped. In the sac was a gangrenous piece of intestine. The patient died, and the autopsy showed the intestine to be the vermiform appendix.

33. HONSELL (*Beiträge zur klin. Chir.*, 1903, xxxvii, 208) reports the case of a woman of 46 years, who had had a small hernia in the upper part of the right thigh, which had been reducible until two days before. There had been violent pain since that time, but no vomiting. The mass was the size of a walnut, and it was painful, tender, and irreducible. An operation was performed under local anæsthesia. A vertical incision was made, and the hernial sac isolated and opened. It contained a clear yellowish fluid. In the sac, the bluish-red, slightly swollen vermiform appendix was found. Poupart's ligament was severed, relieving the constriction. Reduction was then accomplished. The cyanotic discoloration of the peripheral portion disappeared after the reduction. Radical operation for the cure of the hernia was performed, and the patient recovered.

34. The second patient was a woman of 53 years, who had a hernia that had developed suddenly in the right side of the thigh while she was loading hay. There was violent pain, and a small, tender mass appeared. There was repeated vomiting, and flatus, but no stool could be passed for some days. An incision was made over the mass, the hernial sac was opened, and the constricting ring divided. The opening of the sac disclosed bloody fluid. Within the sac was the appendix, together with its mesentery. The strangulation was from $1\frac{1}{2}$ to 2 cm. from the cæcum. A distinct constriction of the appendix and of the mesentery was present. The strangulated part was brownish-red and covered with hemorrhagic spots. The appendix was resected and a radical operation for the hernia was performed. The patient recovered.

35. In the third case, the patient was a woman of 54, who had had a right-sided femoral hernia for many years. It could be easily replaced until four days before, when, while ploughing, the hernia became irreducible. There was violent pain about the thigh; no stool or flatus was passed for several days; no vomiting. The mass was the size of a walnut, fluctuating and tender. It could be traced beneath Poupart's ligament. The skin over it was perfectly normal. Under local anæsthesia an incision was made, and the tumor freed. The hernial sac was only about the size of a cherry. It contained several drops of serous fluid, and a folded black structure, which passed through the narrow hernial opening. Poupart's ligament was incised and also the hernial neck. The structure mentioned was found to be the vermiform appendix with its end twisted on itself; 5 cm. of the appendix was gangrenous, 2 cm. normal. Between these two parts was a deep constriction-ring. The

appendix was resected; a radical operation for the hernia was performed, and the patient recovered.

36. The fourth patient was a woman of 55, who had had a right-sided femoral hernia for several years. It had been easily reducible. For eight days it had been painful and could not be reduced; and neither stool nor flatus had been passed since. There was a tumor the size of a hen's egg, tense, elastic, and painful. The skin over it was slightly edematous. Resistance could be traced below, beneath, and above Poupart's ligament. Under local anæsthesia the hernial sac was isolated and opened. A tablespoonful of turbid, foul-smelling fluid was found. A tough incarcerated piece of tissue, the size of a bean, lay on the floor of the hernial sac. Poupart's ligament and the abdominal covering were severed, and the peritoneal cavity entered. The insertion of the appendix lay above the hernial ring, as did also its tip; but the central portion was within the femoral canal. The mesentery acted as the constricting element. The constricted portion was from 2 to 3 cm. long, and showed two deep furrows. It was blackish and looked gangrenous. No perforation could be found. The appendix was resected, and a radical operation performed. The patient recovered.

37, 38, 39. HUETER (*Chir.*, 1882, ii, 559) says he has seen three cases of right-sided femoral hernia containing the vermiform appendix.

40. JACKLE (*Diss. Marburg*, 1888) describes the case of a woman of 37 years, with a small strangulated and gangrenous-appearing hernia of the right femoral region. There was no fecal vomiting. The skin over the hernia was reddened. An incision was made, and brown, ill-smelling fluid escaped. A small perforated intestinal loop was found. It was partly adherent to its surroundings and covered with pseudomembrane. The femoral ring was narrow. A close examination revealed the fact that the incarcerated portion of the intestine was the beginning of the appendix. The point of strangulation was 2 cm. from the apex. The appendix was ligated and removed, and the patient recovered.

41. JACOBSON (*The Operations of Surgery*, 1897, 637). Woman, aged 43; irreducible femoral hernia; radical cure. Hernial sac contained much fluid; in sac a thick fleshy body, tubular at end; constricted near Gimbernat's ligament. Incision of ligament; reduction of appendix. Recovery.

42. KASINOWSKI (*Diss. Greifswald*, 1871). Woman, 35 years of age, awoke two days previously with vomiting, pain in the right side, and obstruction of the bowels. A right-sided incarcerated femoral hernia the size of a walnut was found. It was tender on pressure. At operation a small amount of fluid and a healthy appendix was found in the sac. The appendix was reduced. The patient recovered.

43. A second case reported by the same author, and quoted by Bajardi, is that of a woman of 44 years, with a right femoral hernia, which had been incarcerated for two days. There was a right-sided vaginal hydrocele, and vomiting occurred. Herniotomy was done. The sac was found to contain a quantity of turbid fluid having a fecal odor. The appendix

was reddish, long, and partly within the peritoneal cavity and partly within the sac. The sac and a part of the appendix were removed. The patient recovered.

44. KEETLEY (*Med. Press and Circ.*, 1890, vol. i, page 85). Woman, aged 53 years. Appendix strangulated in right femoral sac. Patient vomited three times. Herniotomy four days later. No definite peritoneal sac found. Appendix thickened, white, and contained much pus. Ligated and removed. Good recovery.

45. KOELLIKER (*Cent. f. Chir.*, 1901, xxviii, 792) reports the case of a woman of 69, with the right limb flexed at the hip-joint, resembling a patient with coxitis. She could walk only with the aid of a cane; and all attempts to straighten the limb, even while lying on her back, produced violent pain in the lower part of the abdomen on the right side. Her femoral hernia could not be reduced. Operation showed the sac to contain a thickened omentum, adherent to the neck of the sac. In the base of the sac was a very long appendix, adherent at its free end. The appendix was very tense during narcosis, as the limb was straightened. No other intestine was found in the sac. The appendix and the omentum were resected and a radical operation for the hernia was performed. Recovery (not stated, but apparent).

46. KOERTE (*Deut. med. Woch.*, 1901, xxvii, 176, v.) remarks that twice within a year he has operated on incarcerated appendices in small, narrow, crural herniæ. He has no doubt whatever that in each case an incarceration existed, without inflammation. In each case the appendix had a distinct furrow, and the mesentery was hemorrhagically infarcted. There was no suppuration; neither was there a foreign body, a fecal stone, or anything else of that sort. In one case, the patient was an old woman, who had had an adherent omental hernia for some time. An acute incarceration forced operation three days after the beginning of the symptoms, and in the hernial sac the appendix markedly altered, was found.

47. The second patient was a young woman, who did not know anything concerning the existence of a femoral hernia. Suddenly, one morning, she had an incarceration. She was operated on twelve hours after the incarceration, and from the signs, it was evidently a very recent condition. The author is therefore convinced that these cases were pure incarcerations of appendices, and not inflammations of appendices situated within the hernial sac. Result not stated in either case.

48. KOERTE also reports the case of a woman who had had a rupture for some time. It had not been replaceable for several days. She came to the hospital complaining that she had some belching, but no pain. Distinct symptoms of strangulation were missing; but at the operation the author found an appendix sharply strangulated, with its apex on the point of becoming gangrenous.

49. In another case operated on by him, a gangrenous appendix was found in the hernia. Result not stated in either case.

50. LANGDON (*St. Bartholomew's Hospital Reports*, 1891, page 179).

Woman, aged 46 years; appendix in right femoral sac; sudden onset of symptoms twelve hours before operation; vomiting, but loose motions. Herniotomy: sac much thickened. Appendix ulcerated and perforated; removed. Patient recovered.

51. LANGENBECK (quoted by Israel, *Deut. med. Woch.*, 1901, xxvii, v. 177) operated upon a femoral hernia on account of symptoms of incarceration, and found in it, to his astonishment, a strangulated, incarcerated appendix. Result not stated.

52. LEVY (*Arch. provinciales de Chir.*, 1903, xii, 393) reports the case of a woman of 63 years, who had had a small, right-sided femoral hernia for thirteen years. A short time before, after a violent attack of coughing, the hernia had become painful, the pain not permitting the patient to sleep during the night. The mass grew and was found to be irreducible. It was the size of a hen's egg. The skin was tense and very tender, but there was no oedema. An incision was made, and the sac was opened. Serous liquid of a reddish color escaped. The contents of the hernial sac were found to be the appendix, which was very long, swollen, congested, and curved upon itself. It was found to be strangulated at the femoral ring. The appendix was resected and the patient recovered.

53. The second case was that of a woman of 73 years, who had had a small mass in the right groin for two months. It had been gradually increasing in volume, and was the size of a large chestnut. It was not reducible. There had been pain until the last four days. The mass was hard and tender, and the patient had been vomiting several times a day. There was no constipation. Fluctuation was noted and also mobility. A longitudinal incision was made; upon opening the sac a yellowish liquid escaped. The hernial contents were a small piece of intestine, which was gangrenous. The crural ring was stretched, and the piece of intestine escaped into the abdominal cavity. Celiotomy was performed. The gangrenous piece of intestine was found to be the appendix. It was removed and the wound was drained. The patient recovered.

54. LINDNER (*Deut. Med. Woch.*, 1900, xxvi, 259 v.) reports a right femoral hernia that, upon opening, was found to contain a small piece of intestine, which was discovered to be the appendix. It was easily liberated and replaced. On sewing up the femoral canal, faeces suddenly entered it from the abdominal cavity. A laparotomy was performed, and the appendix was discovered to contain two perforations. It was distinctly necrosed and had evidently perforated only a few moments before. The patient died. It was evident that, as the result of the incarceration, a nutritional disturbance developed, and that this produced the ulceration.

55. LOEBKER (*Greifswald*, 1884, quoted by Bajardi) reports the case of a woman of 41 years, with an old, right femoral hernia that had been incarcerated for two days. Herniotomy revealed a partially gangrenous appendix in the lower angle of the sac. The appendix was ligated and removed, and the patient recovered.

56. LUCAS (Guy's Hospital Reports, 1884, p. 436) reports the case of a woman of 47, who for the last five months had had a right-sided femoral hernia the size of a walnut. Repeated attempts at reduction were futile, and vomiting began soon afterward. She had had no movement of the bowels for several days when seen; the tumor was egg-shaped, having a circumference of two inches. On opening, it was found to contain two ounces of serous fluid, and in the sac was the perforated appendix, which was as thick as the little finger. It was ligated and removed; the patient recovered.

57. LUSCHKA (Virchow's Archiv, 1854, vi, 409) examined the body of a woman of 50 years, who had died of pneumonia, and found that she had had femoral hernia on the right side. Within it was found the appendix, twisted on its axis and constricted at its cæcal end.

58. MICHAILOW (Russki Chirurgitscheski, 1895, No. 2) reports the case of a man of 48 years, who had developed sudden pain three weeks before, while lifting a heavy weight. A tumor appeared below Poupart's ligament. At first there was vomiting, and no stool was passed for seven days, after which time the bowels acted. The tumor was the size of a walnut, and extending upward from it an oval mass could be sharply defined. An operation was performed. The hernial sac was opened, and a black body resembling intestines was found. When separated from the hernial walls, this ruptured; and from it came pus smelling like fæces. An incision 10 cm. into the abdomen was made, and the body was found to be the inflamed and perforated appendix. It was resected, and the patient recovered.

59. MORSE (Wien. med. Woch., 1882, xxxii, 431) reports the case of a woman of 42 years, who had had a right-sided femoral hernia for three days. There was violent pain and a tumor, which gradually increased in size and was irreducible. Symptoms of incarceration occurred. The skin was not reddened. The mass was quite tender. An incision over it was made, and the femoral sac exposed. The femoral canal and sac were opened and inside was found the reddened appendix, which was gangrenous. This was resected. The patient recovered.

60. MOTTA (Ital. med., 1882, xvi, 57; quoted by Bajardi) describes the case of a woman of 76 years, with a right femoral hernia that had been incarcerated for three days. There was vomiting; the bowels were moved by means of enemata. In the femoral region there was an elastic tumor, painful and tense. Along the horizontal ramus of the pubis was a tight cord, prolonged upward into the abdominal cavity. Herniotomy was performed. The sac contained a resistant cord, grayish, about the size of the thumb, and terminating in an expansion the size of a nut. The constriction was relieved by incision. The dilated part was excised. The peduncle was found to extend up into the abdomen. The patient died seven days later, of general peritonitis. The autopsy showed the cord to have a central canal, which communicated with the intestine.

61. MUELLER (Diss. Muenchen, 1891). Woman, 75 years of age, three days ago developed a right femoral hernia, at stool. There was violent

pain, and a tender elastic swelling in the groin. Diagnosis: Incarcerated femoral hernia. At operation the hernial sac was found to contain the appendix, which was of a bluish color. The appendix was returned to the abdomen. The patient recovered.

62. MUENCH (*Korrespondenzblatt f. schweizer Aerzte*, 1902, xxxii, 237) reports the case of a woman of 73 years, who had had a right-sided femoral hernia for many years. It had always been irreducible. There had been no disturbance, however, until a few days before the author saw her. Since then it had become larger and painful; there was no vomiting; flatus, stools, and urine, were evacuated regularly. A round, hard mass was noted in the upper part of the right thigh; it was tender to touch; the skin was almost adherent; there was no fluctuation. Local anæsthesia with eucaine was administered. While trying to liberate the hernial sac, ill-smelling pus was evacuated from the posterior surface of the mass. After opening the hernial sac it was found that its only contents were a 12-cm.-long appendix, which passed through the femoral canal. This was resected at a point as high as possible. The patient recovered. A pathological examination showed the appendix to have been perforated.

63. MUUS (*Cent. f. Chir.*, 1901, xxviii, 1037) reports the case of a woman of 64 years, who for years had had a right femoral hernia, which was always easily replaced. A small tumor was always present, preventing the wearing of a truss. During the last month, the hernia had become more painful, forcing the patient to walk in a bent position. When lying on her back the right limb was flexed about 30°; and, on account of pain, she could not stretch it any more. There was very little pain on direct pressure. Operation showed a small lipoma in front of the hernial sac, which contained a healthy, adherent appendix. This was resected; radical operation was performed, and the patient recovered. From this time on she could stretch her limb perfectly.

64. NEWBOLT (*British Med. Journ.*, 1867, i, 781). Woman, aged 21, painful swelling in right groin; had a femoral hernia for two years; always easily reduced. Incarceration for 48 hours; swelling size of hen's egg, hard, tense, tender, irreducible. No bowel movement for three days. Operation: Hernial sac contained vermiform, thickened, congested. Resection of congested part. Reduction of stump. Radical operation. Recovery.

65. NICOLL (*Glasgow Med. Journal*, 1903, lx, 432). Woman; right femoral hernia for many years; for past three days strangulated; painful, tense; constipation, vomiting, abdominal distention, bowels moved with enema. Sac contained feculent pus; the perforated appendix was adherent to neck. Resection. Recovery. Inflammation apparently occurred in appendix which had previously been in sac.

66. OWEN (*Lancet*, 1899, i, 1222). Woman, aged 65; painful swelling existed in right groin for two weeks, increasing in size; bowels regular; no vomiting. The swelling was as large as the fist, hard, but fluctuating in lower part. Abscess opened and contents cleared out; at the bottom

the vermiform was found, strangulated at femoral ring; adhesions at that point. Ligation of appendix. Recovery.

67. POLLOSSON (Lyon med., 1893, lxxiii, 75) reports the case of a woman of 71 years, in a condition of cachexia and delirium. No history was available. In the right iliac fossa above Poupart's ligament was a fluctuating mass, which could be traced down the thigh into the triangle of Scarpa, in front of the femoral vessels. An incision was made above Poupart's ligament. The patient died a few days afterward. The autopsy revealed a purulent collection situated within the peritoneum above Poupart's ligament and a counter opening made on the thigh. Fetid pus was evacuated. It was limited by adhesions to a point about the cæcum and the appendix. The latter was gangrenous and perforated. The purulent collection was traceable into the triangle of Scarpa, and was surrounded by a peritoneal diverticulum forming a sac for a crural hernia.

68. *IBID.* In a second case, the patient was a woman 37 years old, who had had a small tumor in the crural region for five years, but had never worn a truss. During the last two days, without any effort on her part, the tumor had become larger and painful. She had had colic and vomiting. During the last twenty-four hours she had not been able to pass either gas or stool. A diagnosis of strangulated hernia was made, and an operation performed. The patient was anæsthetized, and the operation was conducted as for an ordinary hernia. The sac was incised. It contained an abundance of reddish liquid; but in the interior, instead of intestine or omentum, there was found a reddish cord, 5 cm. long, and of the thickness of the little finger. The neck of the hernia was cut through, and the strangulated portion pulled out. It was found to be the appendix. This was resected, and the patient recovered. A distinct ring of strangulation could be seen below the colon.

69. In a third case, the patient was a woman of 32 years, who had had a right femoral hernia for two years. She had had strangulation once before but recovered. Since that time she had worn a truss. For the last eight days, the hernia had been down, painful, and gradually increasing in size. There was some nausea and constipation. A diagnosis of strangulation was made, and an operation performed. The sac was dissected out and opened, and serous fluid escaped. Within the sac was to be found a small, hard tumor, the size of a terminal phalanx. This was reddish, and was found to be the appendix. The strangulated portion of it was resected and a radical operation was performed. The patient recovered.

70. PUCHELT (quoted by Merling; Diss. Heidelberg, 1836; L'Experience, 1837, i, 337) reports the case of a woman of thirty years of age, with a right femoral hernia that had never before given her trouble. Suddenly, and without external cause, the hernia became strangulated. There was slight pain on mere touch, some vomiting, and fecal retention. An operation was performed, and the vermiform appendix slipped back in the abdomen spontaneously. Patient recovered.

71. QUENU (Bull. et Mem. d. l. Soc. de Chir., 1903, xxix, 801). Woman, aged 42; right-sided irreducible femoral hernia for nine days; pain, swelling; no vomiting; no obstruction; fluctuation. Hernial sac contained appendix, which was congested and red and strangulated about its centre.

72. RIESE (Deut. med. Woch., 1900, xxvi, 259 v.) reports the case of a woman of 51, who for several years had had a right-sided femoral hernia, easily reducible. While lifting a heavy kettle, the hernia came down, and with this was noticeable a drawing sensation of the navel. The mass became larger and the patient had nausea and belching. When she entered the hospital she had had no movement for 24 hours. In the right femoral region there was a tense mass. The abdomen was distended and tympanitic. The skin over the mass was red. An incision was made, and the hernial sac was opened. A turbid fluid ran off, and in the sac was a bluish-black mass, the size of a thumb, which was recognized to be the appendix. It was not adherent to the hernial sac. It was impossible to reduce the appendix, because of the thickness of its mesentery. The abdominal muscles were split for a short distance. The process was then reduced and amputated, and the patient recovered. The appendix showed a furrow 3 cm. below its base, being bluish-black on the other side. The mesentery was swollen. The author believes that during the effort made the appendix entered the sac and became incarcerated.

73. ROMM (Deut. Zeit. f. Chir. 1895, xli, p. 249). Man, 48 years of age; had a small reducible swelling in the left groin. Four days ago it became irreducible and painful. The overlying skin was red and oedematous. There was no vomiting or other obstructive symptoms. At operation a small amount of foul pus was found in a gangrenous hernial sac. The appendix was also in the sac in a gangrenous condition. It contained a small fecal concretion. The appendix was removed. The presence of the appendix on the left side was due to a long mesocolon, and the mobility of the appendix. The patient recovered.

74. ROSE (Deut. Zeit. f. Chir., 1892, xxxv, 51) reports the case of a woman of 54, that had had a femoral hernia the size of a hazel-nut, which, however, gave her no trouble. She wore no truss. Suddenly she developed pain in the hernial sac and began to vomit. She traced this condition to the lifting of a heavy tub. During the next two days she vomited from three to four times a day. The pains became more violent and colicky, and both stools and flatus ceased to pass. The hernia was on the right side. It was tense and tender. Fifty-five hours after the beginning of incarceration an operation was performed. The hernial contents were found to consist of a blackish-red piece of intestine no greater than the size of a pea. It was firmly incarcerated. The operation was very difficult. Upon closer examination, it was found that the incarcerated portion of bowel was a part of an appendix that was itself five inches long. The non-incarcerated portion was very pale; the incarcerated, blackish-red, and probably twice as large as the other part. The patient recovered. The appendix was not removed.

75. ROTTER (über Peritiphilitis, 1896, p. 57) reports the following three cases:

The first patient was a woman of 68 years, who had had an irreducible hernia the size of a hazel-nut for four years. It was occasionally painful. Five days before operation, she had experienced violent pain over the hernia, which became larger, and finally grew to be as large as a hen's egg. There was no vomiting. The bowels were moved regularly. The hernial sac was opened and brownish hernial fluid was discovered. The remaining contents consisted of a dark red node, the size of a hazel-nut, entering through the crural ring. There was a tight constriction. The incision was elongated, Poupart's ligament was divided, and the incarcerated portion of bowel was found to be a knee-shaped part of the vermiform appendix. The tip lay free in the abdominal cavity. The appendix contained pus, but there was no perforation. The cæcum was adherent to the apex of the appendix. The appendix was resected, and distinct constriction was found. The patient recovered.

76. The second case was in the person of a woman of 25 years, who did not know that she had a hernia; suddenly became nauseated, vomited, and had violent pelvic pain. The next day there appeared in the upper part of the thigh a mass the size of a pigeon's egg. It was painful. The bowels were moved regularly, and there was no sign of incarceration. The opening of the hernial sac revealed pus and an appendix that was bent on itself. It was dark-brown, its serous coat was smooth, and there was no perforation. Poupart's ligament was severed, the appendix was removed, and the patient recovered.

77. The third patient was a woman of 60 years, who, shortly after slipping, felt violent pain in the right femoral region. She had never had a hernia before, but she then noticed a distinct swelling. This was followed by vomiting, and the pain continued. The mass grew to be the size of a pigeon's egg. The skin was inflamed, but there were no signs of incarceration. At the operation the hernial sac was made free; Poupart's ligament cut through, and the abdominal cavity opened. The hernial mass had a central constriction, this being due to Poupart's ligament. Within the hernial sac was found some darkly discolored intestine, reaching into the abdominal cavity. This was discovered to be the gangrenous appendix. There was no perforation. The appendix was removed, and the patient recovered.

78. SAUVAGE (Thèse de Paris, 1893) reports the case of a woman with a strangulated right femoral hernia. Its contents were found to be the vermiform appendix, which was reduced after dilating the hernial orifice. The patient recovered.

79. SCHEDE (Deut. med. Woch., 1893, xix, 451) reports the case of a woman of 60 years, with a right-sided femoral hernia. Herniotomy was performed. The hernia contained a gangrenous appendix, which was resected. The hernial sac was sutured, and the patient recovered.

80. SHANDS (ANNALS OF SURGERY, September, 1904) reports the case of a woman 29 years of age, who first noticed a swelling in her right groin in 1899. It developed very gradually, gave no pain or inconvenience,

and always disappeared when the patient assumed the recumbent position. In October, 1903, the lump increased rapidly in size, became very painful on pressure, and did not disappear on lying down. There were no symptoms of strangulation of the bowel. A diagnosis of incarcerated femoral hernia was made, and an operation performed on November 3. Upon opening the sac there was a gush of peritoneal fluid; there was neither intestine nor omentum in the sac, but firmly adherent on the side was the appendix ceci, with the distal end ulcerated and much enlarged. The appendix was amputated in the usual way, and the wound closed as for a radical cure for femoral hernia. The patient made an excellent recovery.

81. SONNENBURG (*Deut. Zeit. f. Chir.*, 1894, 38, 269) reports the case of a woman of 65 years, who had never had a rupture until eight days before operation. While lifting a weight, she had suddenly experienced pain in the right groin, which became swollen and painful. She had had no bowel movement for four days; there had been no vomiting. The patient was very fat. The swelling in the groin was tender to pressure and infiltrated. At operation, pus with a fecal odor was evacuated. The pus-cavity continued upward into a long channel, which corresponded to the crural canal. The patient improved. The pus was plentiful and always had a feculent odor. The pus cavity contained a long cord, dark-gray, with a narrow lumen. This was evidently the vermiform process. After this cord was cast off the secretion became less and the fecal odor disappeared. The patient died some years later, and the autopsy showed the vermiform process to be only 3 cm. long, its free end being adherent to the peritoneum. This showed that a portion of the appendix must have been cast off, after the opening of the hernia. The portion cast off was 8 cm. long. The hernial sac closed within four weeks. The case was evidently one of acquired (not congenital) incarcerated, gangrenous, pure hernia of the vermiform appendix.

82. *IBID* (*Path. u. Therap. d. Peritiphilitis*, 1900, p. 184). The second case was that of a woman of 74 years, who had had a hernia on the right side of the thigh for two years. It had gradually become larger, and during the last two weeks had been irreducible. There was vomiting, but no fecal obstruction; and violent pain in the lower part of the abdomen was felt. The mass was the size of a goose-egg; the skin over it was infiltrated and inflamed. Fluctuation was present. As soon as the skin was incised, pus with the odor of feces and containing gas poured out. The hernial sac was found to be thickened and gangrenous, and within it was the black appendix, which was perforated. This was resected, and the patient recovered.

83. SPANTON (*British Med. Journal*, 1889, p. 126). Single woman, aged 62 years; in October, 1888, had a painful abscess in right groin. Two years before, while carrying a basket, felt something give way in the right groin. It caused pain and a small swelling soon developed, but caused only slight inconvenience. No further notice was taken of the swelling.

August, 1888, surface of swelling became red and inflamed, and skin shortly after broke down, followed by discharge of thin, dark pus.

At examination, erysipelateous blush over upper part of thigh; two sinuses; dirty looking discharge.

Operation: Carefully proceeding, some enlarged glands were removed and appendix exposed; the latter had come down behind the peritoneum; it had no peritoneal covering,—*i.e.*, a retroperitoneal hernia of the appendix. The patient recovered.

84. SPURRIER and CORNER (St. Thomas's Hospital Reports, N. S., Vol. xxxi, 371) relate the following case:

Woman, aged 70 years; one week before coming to the hospital had a bilious attack, accompanied with retching and straining, which caused the appearance of a lump in the right groin. This lump caused very little inconvenience at first, but it gradually increased in size and gave rise to great pain. The patient was well otherwise, and the bowels acted regularly. The diagnosis of strangulated epiplocele was made.

When the sac was opened, it was found to contain the distal inch of the appendix. Gimbernat's ligament was incised, the appendix brought down, amputated, and the stump invaginated with cæcum. Prompt healing followed. The specimen showed a well-marked ring dividing the injured from the healthy parts. The distal portion was blackish-brown, with thickened oedematous walls.

The authors make the following comment: As there was no pain at the time of the formation of the hernia, and not for some hours after, it seems improbable that the appendix was strangulated at once. Again, at the operation the appendix was easily pulled down, though it was swollen far too big to be returned to the abdomen without a "herniotomy." Consequently it seems reasonable to assume that the apparent strangulation was the result and not the cause of the appendicitis.

85. STAATSMAN (Münch. med. Woch., 1904, li, 603) reports the case of a woman of 42 years, who had never noticed that she had a hernia until five days previously, when, without special cause, she had developed sudden pain in the right femoral region. She continued to work; and the next day she noticed a tumor, which gradually increased. There was violent pain in the region of the navel, and the mass could not be reduced. The tumor was the size of a walnut, hard, and elastic. The skin was not reddened. The region was painful to pressure. At operation the lymphatic glands were removed and the hernial sac opened. Within the sac was found a greenish discolored piece of intestine, folded on itself. It passed through the femoral canal, and was found to be the appendix, already gangrenous. Drainage was inserted and the treatment with opium continued. The appendix gradually broke down and sloughed off, and the patient recovered.

86. The second case was that of a woman of 74 years, who had never known that she had a hernia until she had suddenly developed a painful tumor in the right groin three days previously, while carrying a heavy weight. It gradually enlarged, but there was no vomiting, and the bowels

were regular; the tumor became more painful. A diagnosis of incarcerated light femoral hernia was made. At operation there was found lying in the femoral canal the incarcerated appendix. There was no hernial fluid. The femoral ring was divided, and the appendix resected. The patient recovered. The appendix was $5\frac{1}{2}$ cm. long.

87. SWASEY (Med. Record, N. Y., 1881, p. 706). Woman, aged 67 years, spare; while lifting, six years before, felt a peculiar sensation in right Scarpa's space; and later, while bathing, found a compressible tumor, size of a walnut, at saphenous opening. Has worn a truss, but hernia never completely reduced.

January 28, tumor size of hen's egg, painful and irreducible; some abdominal pain and nausea. This sudden trouble followed heavy lift. Operation thirty-six hours after: Sac exposed and clear fluid seen. This was withdrawn by hypodermic needle, and appendix could be seen and felt within sac. It was returned to abdomen by manipulation. Sac not opened. Patient recovered.

88. TACKE (Beiträge z. klin. Chir., 1901, xxix, 72) reports the case of a woman of 54 years, who developed pain in the lower part of the abdomen very suddenly. This pain gradually increased, and a mass developed below Poupart's ligament on the right side. It turned out to be a hernia, which could not be replaced. There was constant nausea, but no vomiting. The mass was about half the size of a hen's egg, and somewhat painful. It could be traced upward above Poupart's ligament into the abdominal cavity, where it was more tender than further down. An operation was performed on the third day. The hernial sac was found to be the size of a small walnut, and, when opened, was found to contain a grayish tumor of considerable length, which closed the hernial neck completely and continued upward into the tumor of the abdomen. A large opening of the peritoneum was made. The tumor was found to be the vermiform appendix with a swollen mesentery. It was but 10 cm. long. The peritoneum was inflamed. The peripheral end of the vermiform appendix was bent on itself and above the bend a black discolored constriction-ring was found. The lower part was necrotic. The appendix was ligated and the patient recovered.

89. TAPIE (Arch. provinciales de Chir., 904, xiii, 479) reports the case of a woman of 67 years, who had had a strangulated right-sided femoral hernia fifteen years before. At the time of its first appearance, she was operated upon, and some intestines were found in the hernia. This was reduced and the hernial sac was closed. Six years later the hernia recurred; but, as it was easily reducible, she wore a truss. During the last two years the truss was not worn, and the hernia soon became irreducible. It had been gradually increasing in volume. Suddenly it became very painful, and colicky attacks occurred. The patient began to vomit and was soon in the state associated with intestinal obstruction. Examination showed a hernial tumor, very hard, painful, and tender. It was irreducible. An incision over the crural arch was made, and the adhesions were dissected. An incision was made into the hernial sac,

in which was seen a strangulated cylindroid mass. This was found to be the appendix. It was from 12 to 15 cm. long, and very much swollen. The constriction-ring was liberated and the appendix reduced. The patient recovered.

90. TILANUS (Nederl. Tidschr. f. Geneeskunde, 1855, Sept.) reports the case of a woman of 65 years, with a tumor of the right thigh, which had been present for nine days. The cause was unknown. The mass gradually increased in size; it was painful, and walking was almost impossible. There was constipation, but no nausea or vomiting, and no abdominal pain. The skin was red and tense. The right labium was hard, and fluctuation was present. An incision revealed a gelatinous exudate. Beneath this was a cavity containing foul pus and fibrin. In the femoral canal was found a piece of intestine $2\frac{1}{2}$ inches long, with the blind end dark blue. It was not perforated and was filled with gas. The femoral ring was incised and the constriction was overcome, but the hernia was not reduced. Exudate was found within the labium. Drainage was inserted. The piece of intestine was found to be the appendix. Peritonitis subsequently developed and the patient died. Half an inch of the appendix was found still within the abdominal cavity, and the cæcum was gangrenous.

91. The second case was that of a woman of advanced age, with a femoral hernia containing the appendix. The patient died of general peritonitis.

92. THOREN (Hygiea, 1887, p. 762) reports a case of incarceration of a vermiform appendix in a femoral hernia. The patient recovered after herniotomy.

93. CARREZ (Lyon med., 1900, xciv, 493) reports the case of a woman, 70 years of age, who had an easily reducible right femoral hernia. She was seized with sudden pain during sleep, when the hernia was found to be hard, painful, and irreducible. There was bilious vomiting.

At operation the sac was found to contain the appendix which was strangulated in the crural ring. The tip was gangrenous, the base was normal.

94. VULLIET (Revue Médicale de la Suisse Romande, 1900, vol. xx, p. 336). Woman, 54 years of age; hernia for fourteen years. She had never worn a truss as the hernia did not cause any inconvenience, and was always easily reducible. One month ago, for the second time recently, violent abdominal pains were felt, the hernia became irreducible and increased in size. There was some nausea but no vomiting; tongue dry, bowels regular. The lump was aspirated and a glass and a-half of clear fluid withdrawn, after which the hernia was reduced. Three weeks later there was a relapse, the same symptoms being repeated. Diagnosis: Strangulated omental crural hernia. Under local anæsthesia the sac was opened; a large quantity of yellowish fluid escaped. The hernial sac was hemorrhagic. The appendix, rigid and turgid, was seen projecting from the crural canal. It was incarcerated, but was reduced after

the ring had been dilated. The sac was resected and radical cure performed. The patient recovered.

95. WARING and ECCLES (St. Bartholomew's Hospital Reports, vol. 27, 1891, page 179). Woman, aged 46 years; first observed a right femoral hernia in 1879. It was easily reducible. She never wore a truss. Confined in 1887. Swelling did not reappear until January, 1890, when it was irreducible and painful. Replaced by a doctor, and truss worn since. In usual health until evening of January 18, 1891, at 7 o'clock. Had severe griping pains, loose motions, and passed flatus by mouth. Later vomiting. Next day taxis under chloroform; unsuccessful. Operated: Sac contained only appendix. Stricture divided; appendix pulled down, and ulceration and perforation at site of constriction. Appendix ligated with silk above, and cut away. The patient recovered.

96. WETTE (Inaug. Diss. 1889, Aachen; quoted by Bajardi; also by Brieger; Arch. f. klin. Chir., 1893, xlv, 892) reports the case of a woman of 87 years, with a right incarcerated femoral hernia. Herniotomy was done. The sac contained clear liquid, and an appendix with a relatively long mesentery. The appendix was reduced and radical operation was performed. The patient recovered.

97. WÖLFER (Arch. f. klin. Chir., vol. xxi. p. 432). Man, aged 19 years; appendix strangulated in right femoral hernia; constipation, nausea and vomiting. Herniotomy. The adherent appendix was left in the sac. The patient recovered.

98. ALFRED C. WOOD. (Author's case.) In the summer of 1900, a woman about 70 years of age was admitted to St. Agnes's Hospital at the request of her physician on account of what was thought to be a suppurating right inguinal bubo.

Upon examination a swelling about as large as an egg was found beneath Poupart's ligament on the right side. It was somewhat irregular in outline, painful on pressure and soft to the touch. The surface was of a dark red, almost livid color. According to the history, the swelling developed suddenly, ten days to two weeks before, without any cause that could be assigned. If a hernia existed previously it had not been observed. The temperature was between 101° and 102° and the pulse correspondingly accelerated. The tongue was furred and dry. The whole picture resembled quite accurately a late stage of suppuration of the vertical chain of inguinal lymph-nodes, although no lesion was found on the foot or leg to account for such a condition. The very soft character of the swelling noted was accounted for by the fact that hot flaxseed poultices had been applied for several days.

When the skin was divided a necrotic mass was exposed in which there was but very little fluid, and that was turbid and watery rather than purulent. After the necrotic structures had been removed as far as possible, the appendix was found in the bottom of the wound, the distal half being gangrenous. After cleansing the cavity the incision was extended upward until the base of the appendix was exposed. The tissues being healthy at this point a ligature was applied and the diseased part was removed. The incision was only partially closed by sutures, free drainage being provided, as there was great probability of peritonitis following. The wound did not do well; the inflammation, which was already present, spread, and took on an erysipelatous character. The patient's tongue became more dry and coated, the bowels moved only with the greatest difficulty, the temperature and pulse gradually rose, and the patient died about a week after the operation, from sepsis.

99. (Author's second case.) Mrs. B., aged 65 years, was seen by the writer in consultation with Drs. Bellows and Reckefus, August 10, 1904, on account of a lump in the right groin. Her attention was first drawn to this condition after retiring on the evening of July 19, 1904, during a stay at the seaside. She discovered, quite by accident, during full extension of her thigh, a lump about the size of an egg, in the right groin. There was a very slight diffused pain about the front of the thigh, but otherwise no inconvenience was felt. On the following morning she consulted a physician, who told her the swelling was a femoral hernia. Nothing was done for the condition until she returned to her home on 3rd of August, when she called upon her family physicians, who arranged for the consultation, which was held on the date mentioned.

Upon examination, a swelling about as large as half an orange was observed in the right groin, below the inner half of Poupart's ligament. It was almost painless, presented an elastic sensation to the touch and gave a flat note on percussion. There was an indistinct suspicion of an impulse on coughing. The mass could not be reduced. It was the unanimous opinion that the condition was an irreducible femoral hernia. That the sac did not contain intestine was evident by the entire absence of obstructive symptoms, as well as the dull note on percussion. It was, there-

fore, supposed that the hernia consisted of omentum,—an incarcerated femoral epiplocele.

About two years ago the patient had an illness which was thought to be "grip." Since this time she had not been well. She was unable to exercise as usual on account of feeling weak and short of breath, although previously strong, and still of robust appearance.

In the general physical survey, the condition of the heart at once attracted attention. The action was very irregular; some beats were very feeble and imperfect, while others were loud and tumultuous. The rhythm was entirely upset, the intervals between the impulses varying greatly. The pulse could not be counted at the wrist, as only the stronger contractions of the heart were registered, nor could the heart-beats be definitely counted by auscultation over the precordia, owing to the extreme irregularity spoken of, but as nearly as could be estimated they were about 120 per minute.

The urine was scanty in amount, but otherwise normal. The other organs appeared sound.

An operation was advised in spite of the condition of the heart, as it was manifestly unsafe to permit an irreducible hernia to remain in that condition, even if composed of omentum only. The patient entered the University Hospital August 15. There had been no change noted in the meantime.

The operation was performed on the following day, the patient having been prepared in the usual manner. As the chief cause of anxiety was the anæsthetic, specific instructions were given as to the administration of the ether, and arrangements were made in advance to carry out each step of the operation with the least possible delay in order to shorten the time of operation.

A vertical incision, three inches in length, was made over the swelling and the mass fully isolated. The sac was thickened and opaque and under such extreme tension that it was impossible to distinguish the nature of its contents. It was therefore carefully opened, when a considerable quantity, estimated at between two and three ounces, of slightly turbid straw-colored fluid was forcibly discharged. The sac then seemed to be empty, but on enlarging the opening and inspecting its interior the vermiform appendix was observed protruding from the neck of the sac,

probably one-half of its length being external to the latter. There was not a trace of omentum or other structure in the sac. The appendix appeared perfectly normal in color, but was slightly swollen and cedematous. It did not show any evidences of acute inflammatory change, but either from constriction or adhesions, was held firmly in its new position. The problem of the proper disposition of the appendix at once came up. Its removal would have necessitated extending the original incision into the abdominal cavity, or the making of a second incision at the usual site for reaching the appendix. Both of these procedures were highly objectionable on account of the patient's physical condition, already referred to. On the other hand was the appendix so damaged that its return to the abdomen would subject the patient to the risk of peritonitis, or the inconvenience of a second operation? While this problem was being weighed and discussed, the appendix which was held by the constriction of the neck of the sac, and also by the adhesions, was being liberated by the finger. A final examination of the process led me to decide to accept what I considered to be the remote risks mentioned, rather than prolong the anæsthesia and thus add to the danger of the present operation, an opinion which was shared by both of the patient's physicians. The appendix having been returned, the sac of the hernia was ligated as high as possible and excised. The operation was concluded by performing a radical cure according to Bassini's method.

The patient made a satisfactory recovery in every particular, the wound healing by primary union, and the general condition was quite as good as before the operation. She was discharged from the hospital on the 3rd of September. The patient has constantly improved in health since leaving the Hospital.

100. WULFF (*Deut. med. Woch.*, 1901, xxvii, 175, v) reports the case of a woman who had had an easily reducible femoral hernia for a year. Four days before admission, while bending forward, she suddenly experienced violent pain in the region of the hernia. Two days after this, there was nausea and the hernia could not be replaced. At the time of admission, she showed a rounded mass below Poupart's ligament, covered with normal skin, and somewhat tender. There was a slight rise of temperature; no peritoneal irritation; but a slight drawing at the umbilicus. Operation showed the hernial sac to contain a clear, slightly bloody fluid, in which was the hemorrhagic free appendix. Its mesentery

was rich in fat, and discolored. At the hernial ring there was a distinct furrow; and on the other side of it the appendix was perfectly normal. Resection of the process and closure of the wound were followed by the recovery of the patient. The appendix was 12 cm. long. There was no pus, fecal mass, or mucus in its lumen; and no stenosis. The appendix was not gangrenous below the constriction, even though there was a hemorrhagic infarct. The condition was due to a pure incarceration.

OBTURATOR APPENDICULAR HERNIA.

Although the subject of obturator appendicular hernia is foreign to this paper, I have included the report of a single example. It is introduced here because it is nearly or quite unique, none of the writers quoted having mentioned the subject except Spurrier and Corner, but their collection did not include any illustration.

The case is described by Bary (Dissertation, Greifswald, 1893) and is as follows:

A woman, 42 years of age, had a painful mass in the region of the pectineus and adductor muscles. It gradually became larger and fluctuating. Operation was refused and the patient died. At the autopsy, an abscess was found beneath the pectineus and between the adductor muscles. The pelvic cavity behind the obturator foramen was filled with pus. The foramen was sufficiently open to permit the index-finger to pass through. Within it and adherent to it lay the perforated apex of an appendix four and a-half inches long. There were no symptoms of incarceration. The peritoneum was free from signs of inflammation.

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INGUINO-PROPERITONEAL HERNIA; INGUINO- INTERSTITIAL HERNIA.

REPORT OF CASES WITH REMARKS.¹

BY ALBERT E. HALSTEAD, M.D.,

OF CHICAGO,

Professor of Surgery in the Post Graduate Medical School; Attending Surgeon to
Cook County and St. Luke's Hospitals

CASE I.—*Strangulated Inguino-properitoneal Hernia; Reduction en masse; Herniotomy; Recovery.*—F. M., male; aged 52; admitted to the St. Luke's Hospital January 18, 1904. History: The patient has had a right inguinal hernia for six years past. He first noticed it after lifting a heavy timber. It has gradually grown until at the present time it is larger than two fists. Shortly after its development he had a truss fitted by his family physician, which has been quite satisfactory. It has retained the hernia excepting when he was obliged to lift unusual weights. At these times when the hernia came down he could by manipulation effect its reduction without difficulty. Two days ago the hernia slipped by the truss while he was loading wood upon a sleigh and was allowed to remain down about an hour before an attempt was made to replace it. When an effort was made to reduce the hernia it failed. The pain was moderately severe, but not sufficient to prevent his finishing his day's work. After returning home in the evening, another unsuccessful attempt was made to reduce the hernia. The pain had now become quite severe and was accompanied by nausea. About 10 o'clock at night he vomited once. After this he became alarmed and sent for his family physician, who administered a hypodermic of morphine and applied hot fomentations to the hernia. After an hour the hernia was reduced. At the time he noticed that the swelling did not disappear suddenly as it had on former occasions when the gut slipped back into the abdomen. The pain was lessened but did not subside completely. The large tumor had

¹ Read before the Chicago Surgical Society, January 5, 1906.

disappeared, but he could still feel a small mass in the inguinal region which was exceedingly sensitive to touch. The nausea continued all through the night, but he did not vomit again. There was no bowel movement after the hernia came down, neither did any gas escape. The following morning the symptoms remaining the same he was brought to the hospital.

Physical Examination on admission to the hospital showed the heart and lungs negative. The pulse was slightly accelerated and the temperature was 99° F. The abdomen was moderately distended, but not tender. There was no marked rigidity of the abdominal muscles. Over the middle third of Poupart's ligament on the right side there was a tumor about the size of an English walnut, rather firm, immovable, and tender on pressure. The inguinal canal was empty, admitting the index-finger freely. With the finger in the inguinal canal, the tumor could be felt above and to the inner side of the internal abdominal ring, in the abdominal wall. The scrotum contained the testicles, which were normal in size and appearance.

The subjective symptoms were about as they had been since the accident occurred. There was some pain in the inguinal regions, which he claims is as intense as it was immediately after the hernia was reduced. The bowels have not moved and no gas has been passed. With these symptoms continuing, an operation was advised, it being considered probable that a complete reduction had not been accomplished. The existence of a properitoneal sac was not recognized.

After the usual preparation, the operation for herniotomy was begun. After exposing the external abdominal ring a sac was found extending from the ring down into the scrotum. This was freed from its attachments up to the external ring. The inguinal canal was opened by incising the aponeurosis of the external oblique. After freeing the inguinal sac up to the internal ring it was opened, and from it escaped a small quantity of bloody serum. On pulling down on the inguinal sac, the neck of a second sac was brought into view. This sac was opened by extending the incision made in the first sac. It was seen to contain a small knuckle of the small intestine and a piece of omentum. The omentum was dark in color and œdematous. It was freed from the sac, drawn out beyond its point of constrict-

tion, ligated and cut off. The stump was pushed back into the abdomen. With the replacement of the omentum, the knuckle of gut was freed and dropped back into the abdominal cavity. The second sac was now dissected from its attachments and found to occupy a cavity between the peritoneum and the transversalis fascia. The cavity containing it was above and to the inner side of the inguinal canal. After pulling out the sac from its place in the abdominal wall, it was found to open by a common orifice with the first sac into the abdominal cavity. This orifice, which would barely admit the index-finger, was constricted and surrounded by a dense band of fibrous tissue. In size, the deep sac was not as great in circumference and only about one-third the length of the inguinal sac. It admitted freely the thumb up to the base of the first phalanx.

After carefully studying the relations of the two sacs to each other and to the abdominal wall, the common orifice was enlarged to admit two fingers into the abdominal cavity. The strangulated loop of gut was searched for and brought into the opening. The part constricted was found to be a portion of the convex border of the gut opposite the mesentery; only a segment of the circumference of the gut was strangulated. Although the intestinal wall was discolored, yet the circulation seemed to be undisturbed and its surface still showed its normal gloss. It was deemed safe to replace it in the abdomen. The two sacs were then pulled forward until a funnel-shaped process of peritoneum, their common neck, was brought into view. This was incised beyond the abdominal orifice of the sacs and the resulting opening in the peritoneum closed by suture. The operation for the radical cure of the hernia was completed, Andrew's modification of the Bassini method being employed.

The wound healed by primary union; recovery with cure of the hernia resulted. The patient was discharged February 6, 1904.

The term "inguino-properitoneal" hernia is reserved for those which fulfil the following conditions: (1) There must be two sacs or two divisions of one sac. (2) The inner or intraparietal sac lies between the peritoneum and the transversalis fascia. (3) The outer or inguinal sac occupies the

inguinal canal or extends down into the scrotum for a variable distance depending upon the degree of completeness attained by the hernia. (4) The origin of the two sacs is by a common funnel-like process. They open into the abdominal cavity by a common orifice.

Although Parise¹ first described this variety of hernia, it was Krönlein² who first gave it the name of properitoneal hernia, and described fully its anatomical and clinical peculiarities. Since Krönlein's work appeared, a large number of cases have been reported with but few new facts added to what he had observed. In 1895 Breiter³ was able to find the reports of 36 cases of which no question could be raised as to their place in this group. These, added to Krönlein's 23 cases, made 59, that had been reported up to that year. The works of Krönlein and Breiter have been supplemented by papers from Faghet⁴ in France, Moynihan⁵ in England, and Schmidt⁶ in Germany.

Etiology.—It has been observed that properitoneal hernia is frequently associated with imperfect descent or development of the testicles. Many writers assume from this the existence of a causal relation between the arrest of descent of the testicle and the formation of a properitoneal sac. Undoubtedly, given a case in which the ectopic testicle is placed in the inguinal canal or just below the external ring, associated with a congenital hernia, that, impulses from above continuing while the descent of the gut in the inguinal sac is impeded by the misplaced testicle, the gut will be forced laterally in the direction of the least resistance, which may be the cause of a diverticulum of the sac being forced into the loose cellular tissue between the peritoneum and the transversalis fascia. On the other hand it is well known that many cases of properitoneal hernia have been reported in males in which the testicles, fully developed, have reached their normal position in the scrotum. In a few cases reported, this variety of hernia has been found in the female. Eccles claims that, taking all the reported cases, they are relatively more common in the female than in the male sex.

Considering further the etiology of properitoneal hernia, we may have the return of the bowel from the inguinal sac impeded by a cicatricial narrowing of the neck of the inguinal sac, thus causing a bulging of the neck of the sac between the layers of the abdominal wall.

Repeated and unrestrained efforts at reduction of a hernia made by the patient may be a cause of the development of the properitoneal sac which is secondary to an existing inguinal sac. Obstruction of the inguinal canal other than from a misplaced testicle may assist in forming a second sac. This may be from a congenitally small external ring with an unusually large canal. Cicatricial narrowing of the external ring resulting from a trauma, or the pressure of a misfitted truss which closes the external ring and not the canal, may be factors in establishing a secondary properitoneal sac. Eppinger believes them to be all congenital, the inner sac developing from a diverticulum of the funicular process between its point of origin and the internal ring, which is usually constricted. Schmidt accounts for the internal sac by assuming the existence of a dislocated internal ring. As a result of this dislocation, the normal descent of the testicle is interfered with and an inner sac is formed from the upper portion of the inguinal process. Congenital diverticular pouches located about the inner ring as first observed by Rokitansky may constitute a starting-point for the formation of a properitoneal sac. Moynihan has observed them in adults, but more often in the fetus.

Reduction *en masse* has been considered as a cause of properitoneal hernia. The phenomenon known as mass reduction has been frequently observed in those hernias in which a bilocular sac existed. It is probable that in a large proportion of cases in which this accident has occurred, there existed previous to the reduction a second sac into which the contents of the inguinal sac had been frequently forced. Strangulation after one of these apparent reductions continues from constriction of the common abdominal orifice of the two sacs.

At the operation or at the autopsy the presence of a properitoneal sac may be first discovered. The generally-accepted explanation of the so-called reduction *en masse* is that an inguinal or crural sac, by repeated and forcible manipulation, is separated from its attachments to the surrounding structures and invaginated, or is pushed into the abdominal cavity without the relations existing between the sac and its contents being changed by the change in position of the sac. It may be here stated that such a separation of the sac, particularly of a congenital hernia, would seem impossible. The difficulty mentioned in separating an acquired hernial sac from its attachments in herniotomy, which in most operations is considerable, would seem to preclude the possibility of this occurring from taxis applied through the intact coverings of a hernia. Strubel⁷ believes this usual explanation of reduction *en masse* of a hernia to be unsupported by autopsy, and considers that it occurs only in bilocular hernia of some variety. Other accidents that may simulate reduction *en masse*, but which cannot be strictly so considered, are rupture of the sac with the escape of the hernia into a pocket in the abdominal wall, or rupture of a sac containing a large quantity of hernial fluid with the escape of the fluid into the abdominal cavity or between the muscles of the abdominal wall, the gut or omentum remaining strangulated. This occurring in a fat patient where the wall is thick and hernia small, the presence of a strangulated piece of intestine in sac might be overlooked. The diminution in size of the tumor might be considered evidence of complete reduction of the hernia.

In summing up the factors that appear to us as being the most important in the causation of properitoneal hernia, and also of the other forms of interstitial hernia, we may mention that there appears to be good reason to believe that congenital defects such as incomplete descent of the testicle, congenitally misplaced internal abdominal ring, unusual narrowing of the external ring, or congenital diverticular-like process of the peritoneum about the internal ring, may deter-

mine the development of a secondary interstitial sac, the inguinal sac being primary in time of development. It has been shown that bilocular hernia occurs more frequently on the right side than on the left (33 in right and 20 in the left in 59 cases collected by Breiter). It is also well known that ectopic testes occur oftener in the right side, and that the funicular process closes later on the right than on the left side. These facts indicate that some relation may exist between these congenital defects and the occurrence of a properitoneal hernia. However, the existence of this variety of hernia without the congenital defects mentioned above indicates that the other etiologic factors detailed may occasionally determine the development of a second sac. The chief we believe to be the use of a poorly fitted truss.

Relation of the Properitoneal Sac to the Internal Ring.—

The inner or properitoneal sac generally occupies one of three positions: (1) Between the internal ring and the anterior superior iliac spine, its long axis being directed upwards and outwards parallel with Poupart's ligament. This is the usual position and easiest recognized before the sac is exposed either by operation or autopsy. (2) It may be directed downwards and inwards to the side of or in front of the bladder. This form has been described as *hernia inguinalis ante-vesicalis*. (3) It may be directed backwards and occupy the inner part of the iliac fossa. In this variety the inner sac lies close to the retroperitoneal pouches that are known as the subcæcal fossæ. Moynihan believes that certain cases described as hernia into the retrocæcal fossæ have in reality been properitoneal hernia belonging to this third group. U. Schmidt⁸ describes an inguinal-properitoneal hernia in which the properitoneal sac extended from the internal ring to the obturator foramen, occupying a part of the true pelvic cavity. The patient had what was considered a common left inguinal hernia that had existed for several years. Twice it had become strangulated. The first time reduction, which was easily made without an anæsthetic, was complete. A few months later it again became

irreducible and painful. An attempt at reduction was made and considered successful. The symptoms of strangulation continued. Operation upon the second day after the apparent reduction showed the inguinal sac to contain only about 30 c.c. of bloody fluid. As the cause of the persisting symptoms of strangulation could not be discovered through the herniotomy wound the abdomen was opened in the median line. With the patient in the Trendelenburg position a careful search revealed the properitoneal sac deep in the pelvis. An opening connecting with the inguinal sac that just admitted the index-finger was located. The strangulation occurred at the neck of the properitoneal sac.

The size of the properitoneal sac is usually small, and in this respect bears no relation to the inguinal sac. Many of the reported cases were described as Littre's hernia, the properitoneal sac containing only a small diverticular-like segment of the circumference of the gut. This was the condition found in our case.

The inguinal sac may occupy any part of the inguinal canal or extend into the scrotum. It is frequently congenital, and at times double. In itself it differs in no particular from the sac of an ordinary inguinal hernia. The common abdominal orifice of the two sacs is frequently contracted. Its margin may be rigid from the presence of cicatricial tissue, due no doubt to repeated traumatism from the forcible reduction of the hernia.

The diagnosis of Properitoneal Hernia is seldom made excepting when the properitoneal sac is exposed to view during an operation or at the autopsy. Braun⁹ reported what he believed to be the first case in which the presence of a properitoneal sac was recognized and the exact anatomic condition detailed before the patient was operated upon for the relief of the strangulation which existed.

The usual history of these cases is that a patient with an inguinal or femoral hernia which has been hitherto reducible, suddenly develops symptoms of subacute or acute stran-

gulation. Reduction by taxis is attempted and followed by apparent success. The pain, obstipation and other symptoms of strangulation persist, with a fatal termination unless relieved by operation.

The presence of the properitoneal sac when filled with gut or omentum can be recognized in some cases. In those in which the sac is directed upwards and outwards, the presence of a tumor or tumefaction makes it possible to map it out.

When the sac is directed downwards and inwards toward the bladder, or when it is directed backwards in the pelvis, its deep location precludes the possibility of its recognition by palpation or percussion. In Breiter's collection of 36 cases, it was possible in 22 to recognize a tumor which was proved either by autopsy or operation to be the properitoneal sac.

Moynihan believes these figures to be incorrect, and supports his argument by the examination of specimens found in the museum of the London Hospital. These show that in the majority of cases the direction of the sac is such that it could not possibly be recognized by means of physical examination during life.

Strangulation of the properitoneal (or of any variety of bilocular) hernia may happen in one of three places. (1) It may occur in the common orifice of the two sacs. If the hernia appears to have been reduced, it means that the contents of the inguinal sac have been pushed into the deep sac without affecting in any way the part strangulated. If the sac occupies a position which will permit of its being recognized by palpation, the persistence of the symptoms of strangulation are easily explained. The absence of a tumor indicating the presence of a properitoneal sac should not however deter a surgeon from operating in cases of apparent reduction in which the symptoms of strangulation continue. The case of Schmidt, detailed above, demonstrates the great necessity of making a careful search of the hernia region for the properitoneal sac.

(2) Strangulation may take place at the neck of the properitoneal sac. If there is no external evidence of the

existence of this sac, the case will pass for one of intestinal obstruction. The cause will only be revealed after the abdomen has been opened. In all cases of obstruction when there is a reducible hernia, the possibility of a second interstitial sac lodging a loop of gut should be considered.

(3) If the constriction occurs at the neck of the inguinal sac, the case is one of ordinary strangulated hernia. The properitoneal sac may be overlooked even in cases submitted to operation.

CASE II.—*Left Inguino-interstitial Hernia (Hernia Inguino-Subfascialis); Herniotomy; Recovery.*—Adolph K., aged 65, entered the St. Luke's Hospital, July 3, 1905. History: Patient has had a large left inguinal hernia for about thirty years. He states that he has worn a truss for fifteen years and that during the last five years it has failed to retain the hernia completely. Examination while the patient is standing shows that the hernia reaches the bottom of the scrotum and is larger than two fists. The external inguinal ring and the inguinal canal are very large, admitting readily two fingers. There is marked impulse on coughing. When erect, the tumor reaches from the bottom of the scrotum upwards and outwards near the anterior superior iliac spine. When reclining the scrotal enlargement nearly disappears. The tumor between the external ring and the anterior superior spine does not disappear, but becomes less prominent. If an effort to rise is made when the patient is reclining, the inguinal tumor becomes very prominent and its walls quite tense. On percussion it has a uniform tympanitic note. Compression of this tumor causes diminution in size but not complete disappearance.

Both testicles are in the scrotum; both are normal in size, position and consistency. The patient complains principally of a feeling of dragging and weight in the abdomen, and has entered the hospital for the purpose of securing relief through operation.

Operation on July 7, 1905, under Ether Anæsthesia.—The usual incision employed in herniotomy was made, exposing the external inguinal ring and the cord. A hernial sac was found

extending from the external ring down into the scrotum. The relation of the testicle and cord to the sac showed that the sac was acquired and not congenital. After freeing the sac from its attachments up to the external ring, it was opened and found empty. The aponeurosis of the external oblique was then incised from the external to the internal ring, exposing the neck of a second sac. Further division of the external oblique showed this second sac to be about $3\frac{1}{2}$ inches in length and connected with the first or inguinal sac, both sacs opening into the abdominal cavity by a common orifice which admitted two fingers. The second sac lay underneath the aponeurosis of the external oblique resting upon the internal oblique. When opened it contained a loop of intestine about six inches in length which was not adherent and which was readily replaced into the abdomen. The two sacs were drawn outwards, the common neck loosened from the internal ring, a purse-string suture was passed around it and the sacs removed by cutting through this neck. The abdominal cavity was closed by tightening the purse-string suture. The operation was completed by Bassini's method for radical cure of hernia. Healing by primary union, with cure of the hernia.

This case represents the commonest form of interstitial hernia. The classification of these herniæ is based upon the position occupied by the interparietal sac. Any hernia in which a portion of the sac is placed in the planus of the abdominal wall is called interstitial or interparietal. Taking this definition we find clinically that the inner sac has been found: (1) Between the peritoneum and transversalis fascia—the so-called properitoneal hernia, which represents the rarest type of interstitial hernia. (2) Between the internal oblique and the aponeurosis of the external oblique muscles. This is the most common form and was first described by Goyrand¹⁰ and called by him *Hernia Inguino-Interstitialis*. It is also termed *Hernia Inguino-Subfascialis* by Strubel. (3) The parietal sac may lie between the skin and the external oblique. This variety was first described by Kuster¹¹ and termed *Hernia Inguino-Superficialis*. In this type the superficial sac may pass upwards to-

ward the anterior superior spine of the ilium or may reach downward onto the thigh as in Busch's¹² case. In Brocas's¹³ case it extended upwards and inwards toward the umbilicus. In other cases the sac has been found as far down as the perineum. In women it frequently is found beneath the skin of the labium.

In etiology the three types of interstitial hernia have much in common. Much of what has been said concerning the cause of properitoneal hernia applies to the subfascial and superficial varieties. The congenital pouches of Rokitsansky of course cannot be considered as an etiologic factor. Abnormalities of the testes occur frequently. McCready's Tables show that about 73 per cent. of the cases are associated with arrest of descent or some other abnormal condition of these organs. Moynihan considers retained testis as the most important cause of interstitial hernia. This is accomplished by the testis obstructing the inguinal canal, there barring the descent of the hernia, which in the end causes bulging of the sac in the direction of least resistance. In these cases, as in properitoneal hernia, the use of an improperly fitting truss would appear to be of importance as a factor in developing the diverticulum that forms the interparietal sac.

The diagnosis of interstitial hernia is generally easily made if the anatomic types of hernia are kept in mind. The bulging parietal sac can generally be easily recognized. The frequent association of this form of hernia with anomalies of the testes should direct attention to the possibility of this hernia when imperfect descent of these organs exists. Strangulation of the subfascial and superficial types unlike that of the properitoneal is infrequent.

The treatment of interstitial hernia, including the properitoneal type, can be only operative. The wearing of a truss can do nothing but harm. The presence of a retained testis is always a contraindication to the use of a truss in any hernia. When a parietal sac exists it can only increase the already great risk of strangulation.

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THE ETIOLOGY OF CERTAIN CONGENITAL TUMORS OF THE GROIN.

THEIR RELATIONSHIP TO HERNIAL SACS.

BY R. HAMILTON RUSSELL, F.R.C.S.(ENG.),

OF MELBOURNE, AUSTRALIA,

Surgeon to the Alfred Hospital ; Consulting Surgeon to the Melbourne Hospital
for Sick Children

IN 1896, by one of the curious coincidences that often arise in Surgical Work, there came under my care at the Melbourne Hospital for Sick Children, two cases of benign tumor of the groin, evidently similar in nature, the etiology of which was at the time quite unknown to me.

The notes of the cases are as follows:

CASE I.—Boy, aged 6, with a tumor the size of half an orange at the upper part of the left thigh, a little below the femoral opening. Soon after birth a small lump was noticed there, but it had gradually and very slowly enlarged. The tumor was occasionally the seat of attacks of pain and tenderness; these attacks had been somewhat more frequent of late, and were attended with some enlargement of the tumor, which enlargement would subside as the attack passed off. The tumor gave the sensation of a soft solid, but there was no lobulation and no attachment to the skin. After removal it was found to be not encapsuled, and presented the appearance of a mass of fatty tissue, loosely held together by a fibro-areolar reticulum; in the centre of the tumor there was a single cyst with clear fluid contents. Our pathologist, Dr. Mollison, reported that microscopic examination showed in addition to the fibro-fatty tissue, a large admixture of unstriated muscle fibre.

CASE II.—Boy, aged 5, presented a diffuse mass involving the upper and inner part of the left thigh and groin, extending upwards and inwards over Poupart's ligament to the hypogastric and inguinal regions. As in the first case, the tumor appeared to be slowly increasing in size, and the child suffered occasionally

from tenderness and discomfort. The operation of removal entailed a somewhat extensive dissection, but the following characters were noteworthy. Emerging from the femoral canal, where it was thin and stalk-like, it passed upwards and inwards in the manner described, spreading out fan-like over the pubic and inguinal regions. It contained a large number of cysts, which formed a continuous series from the femoral canal to the fan-shaped mass above, throughout which they were irregularly distributed, as depicted in the diagram. The structure of the tumor was reported by Dr. Mollison to be identical in nature with that of the former case. There is no record of any special examination of the minute structure of the walls of the cysts. The accompanying diagram (Fig. 1) will serve to show the positions occupied by the two tumors, which were both on the left side.

It is worthy of mention that Case I came again under my care six years later for a right inguinal hernia. The result of the first operation had remained perfectly satisfactory. Case II I have been unable to trace.

From the circumstance that I have met with no other examples than these in my experience, I gather that such tumors must be of great rarity, though doubtless other surgeons may be able to recall similar cases. I am not, however, aware that these growths have been specially described nor that any suggestion as to their etiology has been offered. It has accordingly been a matter of great interest to me to find the explanation of the occurrence of these singular tumors incidentally provided in the course of some clinical observations I have been enabled to make during the last few years on the origin of the femoral hernial sac.

There appears to me no reasonable doubt that the etiology of these tumors is identical with the etiology of the femoral sac. As, however, the congenital origin of the femoral sac is not as yet universally admitted, may I be permitted in the first place briefly to outline the views I have already expressed fully on two previous occasions in the *Lancet*, as to the nature and congenital mode of occurrence of the femoral sac? I

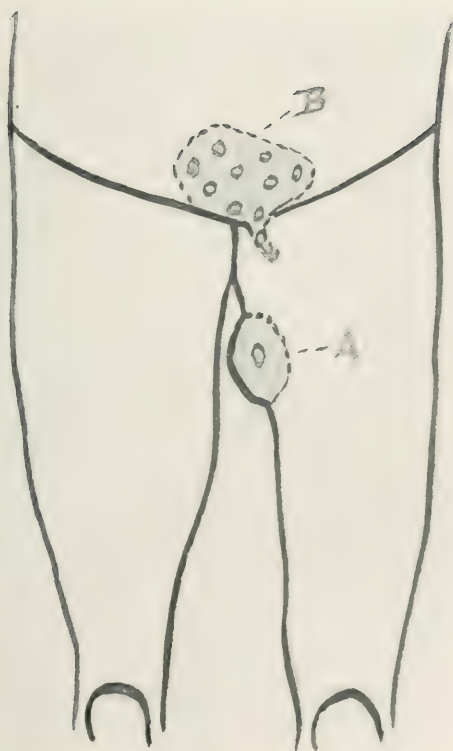


FIG. 1.—Showing position of the tumors in the two cases. A, Tumor in Case I. B, Tumor in Case II.



FIG. 2.—Diagram of embryo in section at about second month. *A*, Limb-bud with pouch from pleuroperitoneal cavity. *B*, Pleuroperitoneal cavity.

cannot do better than by giving verbatim one or two short extracts from a paper on the congenital origin of Hernia: (*Lancet*, March 12, 1904.)

“At an early period of embryonic development, the three primary layers of the embryo become arranged in the manner depicted diagrammatically in Fig. 2. Ventrally, two main layers are formed, the somatopleure closing in the primitive alimentary canal, and the splanchnopleure constituting the body-wall. Between these two layers is situate the primitive pleuro-peritoneal cavity, enclosed throughout by mesodermic tissue, on the inner surface of which a layer of cells, flattened and stratified, will ultimately become specialized as the endothelial structure of the peritoneum. During the second month, bud-like projections are extruded from the surface of the body-wall, which are the rudiments of the four limbs. These buds are projections of the whole thickness of the body wall, and it may quite probably be a normal event for a pouch of peritoneum to be included in the bud (Fig. IIA), and to become subsequently obliterated. Whether this inclusion of a pouch of peritoneum is a normal event, or whether it is a developmental accident, matters not at all. That which does concern us is the fact that such a pouch of peritoneum is not only often formed but that it often persists; further that it may occur in more than one situation in the limb but that its most frequent seat is in the immediate vicinity of the main vessels, in the future crural canal. This peritoneal pouch having been formed at a very early period, it becomes a matter of extreme interest to trace its destiny, and see how it will fare during the period of rapid changes associated with the developing limb.

I have been accustomed to show that the course so frequently seen to be taken by a femoral hernia upwards on to the abdomen, which has been a source of so much perplexity to surgeons, is in reality nothing more than the inevitable result of the congenital origin of the femoral sac. I have illustrated this by a diagram (Fig. 3), which depicts the result of the evolution of the limb upon the branches of the common femoral artery.

"The explanation of the somewhat retrograde course pursued by these becomes very evident if we refer back to the first beginnings of a vascular system in the embryonic limb-bud. The first branches that are given off from the main vessel of the limb-bud will be apportioned to structures that are destined to form part of the abdominal wall, so that when, in the course of development, the groin becomes deepened, and the limb undergoes changes that are to fit it to straighten out, it will at once be seen



FIG. 3.

how it comes about that the superficial epigastric artery and its fellows follow the course they do. A little twig passing directly upwards will ultimately become the superficial epigastric; another with a slightly outward tendency will become the circumflex iliac, and one or two passing somewhat inwards, the external pudics.

"And now that we have arrived at a conclusion as to the causes that have determined the course of the branches of the common femoral, it would seem reasonable to expect that a con-

temporaneous peritoneal sac, occupying a similar position in the evolving limb, should, in response to the same developmental influences, incur a like fate. So that one sac, which is of sufficient length, and suitably disposed at its inception, would assume a position similar to that of the epigastric artery; another, in like manner, will display an outward and upward direction like the circumflex iliac; while yet another will follow a course corresponding to that of the external pudics; and this is exactly what we find.

"It is impossible to look at Fig. 3, which represents the branches of the femoral artery on one side, and the favorite positions assumed by femoral sacs on the other, without being impressed with the conviction that the developmental influences which determine the course of the arteries on the one hand, and the position of the hernial sacs on the other, are identical."

Thus it is clear that any structure which at the first appearance of the limb-bud should chance to be placed as it were on the borderland between the future limb and the future abdominal wall, will inevitably in the completed process of development come to have one end in the limb and the other in the abdominal wall, and will thus occupy precisely the position of the branches of the femoral artery, and also of the hernial sacs that pass upwards, from the femoral opening across Poupart's ligament. Moreover, I submit that in no other way than that here suggested, could any anatomical structure come to occupy such a position.

The correctness of this view as to the etiology of the sac of femoral hernia has been confirmed by a quantity of clinical evidence which it is unnecessary for me to re-state here. There is, however, one or more short quotations which I will make from a paper from which the previous extracts have been taken. This deals with the structure of the femoral sac, and has a very direct bearing upon the subject before us, and is as follows:

"It (the femoral sac) is often a thick structure, lined it is true with endothelium continuous with the peritoneum, but com-

prising in addition a quantity of unstriated muscle fibre, fibrous tissue and fat."

It will be noted that the tumors I have described are identical in composition with the femoral sac as here described, with the sole addition of certain cysts. In addition to their structure the positional arrangement of the tumor in Case II furnishes conclusive evidence of its mode of origin. In Case I, taken alone, the position of the tumor would have afforded evidence that was merely inconclusive.

The cysts still remain to be accounted for. Assuming the suggested origin of these tumors from a diverticulum of the primitive pleuro-peritoneal cavity to be correct, have we any direct evidence bearing upon the origin of the cysts? I myself have met with but one instance in which a cyst has been formed in the wall of a hernial sac. This was, however, the funicular process, and the case is described in the paper from which I have already quoted. Cysts in connection with hernial sacs have occasionally but very rarely been described, but one case that occurred in the practice of the late Mr. Hulke presents features of special interest. I am indebted for the description of it to Macready's "Treatise on Ruptures," from which I will extract a few lines:

"During the operation for a strangulated femoral hernia a 'glistening membranous bag came into view.' The membranous bag was opened and serum escaped. The interior was a smooth-lined cavity whose posterior wall was convex, tense, elastic, in some parts blue and thin, in others glistening, white and tendinous. It was overrun by a net of large veins. At first sight this resembled an ovarian cyst, but on tracing its convex surface it seemed everywhere adherent at the periphery. It was opened and a few drachms of clear serum were let out. In the floor of this second cyst a third, still deeper and distinctly limited sacciform space was discovered, which also contained serum. Through the posterior wall of this third cyst a small globular body about the size of a grape was felt which proved to be the true sac."

Summary.—The congenital origin of the femoral hernial sac is shown by (1) its composition, especially by the presence of a thick fibro-fatty covering containing a quantity of unstriated muscle fibre; (2) by the various positions it assumes, especially in passing upwards on to the abdomen; (3) by various other characteristics which are matters of clinical observation and have been dealt with elsewhere. From the study of these features we deduce the conclusion that the femoral sac is formed by the inclusion in the embryonic limb-bud of a diverticulum from the primitive pleuro-peritoneal cavity with its mesoblastic wall.

Turning to the two tumors, they are obviously identical in nature one with the other, and both by their position and structure they proclaim their identity in origin with the femoral sac. It would, therefore, seem reasonable to conclude that they also owe their origin to the accidental inclusion in the embryonic limb-bud of a diverticulum from the primitive pleuro-peritoneal cavity.

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THE DETERMINATION OF THE FUNCTIONAL CAPACITY OF THE KIDNEYS.

BY ALBERT ASHTON BERG, M.D.,

OF NEW YORK,

Adjunct Surgeon to the Mount Sinai Hospital.

THE determination of the combined and individual functioning power of the kidneys is one of the most important considerations connected with the modern treatment of surgical diseases of these organs. The problem is a threefold one. Firstly, what is the combined work of the kidneys; secondly, what part of the total work is each organ doing; and thirdly, what work can each one do, if its fellow is removed or seriously injured,—*i.e.*, what is the potential functional capacity of each organ?

This last bears no constant relation to the former. Thus, it is not at all uncommon for a healthy kidney that is potentially able to perform the work of both organs to do temporary insufficient work because of a diseased condition of its fellow; and, *vice versa*, kidneys that are doing enough work may functionate altogether insufficiently when one or both of them are subjected to an incisive surgical procedure.

Experience has taught us that a single healthy kidney usually has the potentiality for doing work that is sufficient for the needs of the body, and furthermore that if the functional power of such an organ is hindered a removal of the cause thereof will be followed by a complete resumption of its sufficient functional work. On the other hand, we have also learned that a considerably diseased kidney has not the potential capacity of doing the entire work of the body. Whenever, therefore, a nephrectomy is contemplated it is of the utmost importance to determine the health or disease of the other organ. If the urine which is drawn from the latter by aseptic ureteral catheter shows it to be healthy the operation

may be proceeded with, even though its functional capacity is for the time being insufficient, for such an organ will manifest sufficient functional capacity when its diseased fellow is removed; if, on the other hand, the urine from the remaining kidney points to extensive disease therein, all incisive procedures upon the more diseased side should be abstained from, even though the functional capacity of the two organs at the time of our examination is a sufficient one.

The combined work of the kidneys is determined from the cryoscopic index of the blood,—*i. e.*, its freezing-point, and from the amount of urea which is eliminated in the urine in twenty-four hours; and the work of the individual organs is ascertained from the percentage of urea in the individual urines, from the amount of sugar and chromogen in each urine after a hypodermic injection of phloridzin and methylene blue respectively, and from the cryoscopic index,—*i. e.*, the freezing-point of the individual urines.

As the work of a kidney corresponds to the amount of secreting parenchyma it contains a comparison of the work done by the two organs will often indicate which one is diseased and if both are affected it will reveal which is the more extensively involved.

The Cryoscopic Index of the Blood.—The duty of the kidneys is to eliminate from the blood the waste products of tissue metabolism. In comparison with the other emunctories they are by far the most active, and if they functionate insufficiently these waste materials will accumulate in the blood and increase its molecular concentration. The determination of the latter, then, should give us information of the work that is being done by the kidneys. To ascertain the molecular concentration of a fluid we find out its freezing-point,—*i. e.*, its cryoscopic index, for this is directly proportionate to the number of molecules the fluid holds in solution.

The normal freezing-point of the blood is 0.56° to 0.60° C. below that of distilled water, and of course the greater its concentration is the lower will this freezing-point be. Thus

with insufficient kidney function the freezing-point falls below 0.60° C., in one case of the writer, to 0.87° C. The first question that arises is how constant is the freezing-point of the blood with normal functioning kidneys and the next query is how reliable an index of insufficient combined kidney function is a depression of the freezing-point below the normal. In the first place, it is essential to remember that one-fourth of the total kidney-tissue is sufficient to perform the work of the kidneys and to maintain the freezing-point of the blood at its normal level. With this preliminary note, it may be said that with sufficient kidney function the freezing-point of the blood is fairly constant at 0.56° C.— 0.60° C. below that of distilled water. There are fluctuations, however, and amongst the most common causes of these may be mentioned large intra-abdominal tumors especially of the kidneys; heart disease, insufficient oxidation of the blood from respiratory disease, and one-sided renal pain. In these conditions the freezing-point of the blood may fall far below its normal level, and yet there may be no disturbance in the sufficiency of the kidney action; due allowance must, therefore, be made in them for abnormal depression of the cryoscopic index. Again, a severe anæmia, which is common enough in kidney diseases, may prevent the freezing-point of the blood falling to that level which would correspond to its molecular concentration.

Thus one might meet with a case in which with considerable insufficiency on the part of the kidneys, the freezing-point of the blood is, nevertheless, near the normal because of the severe grade of anæmia that is present.

With the exception of the abnormalities due to the causes just mentioned, we may say that a normal freezing-point of the blood,—*i.e.*, 0.56° C. below that of distilled water, indicates sufficiency of kidney function. It does not by any means permit us to infer that the kidneys are entirely normal, nor that their function will be sufficient after incisive operations upon them. If we remember that one-fourth of the total kidney-tissue can thoroughly well perform the entire work

of the kidneys we will understand how it is that cases, in which the freezing-point of the blood was normal before operation, exhibited marked insufficiency of kidney action after operation. For in such cases the kidneys either did not possess the potentiality for increased work, a *sine qua non* for the remaining kidney if there is to be a successful issue after nephrectomy, or by the operation we destroyed or injured enough of the remaining working parenchyma to seriously interfere with the sufficiency of the kidney action.

Furthermore, if a normal cryoscopic index does not indicate a potentially sufficient organ, neither does an abnormally low freezing-point always indicate a potentially insufficient organ, for we have seen above that a potentially sufficient organ may be temporarily insufficient because of the disease of its fellow.

In other words, the cryoscopic index of the blood merely indicates the work that is being done by the renal organs. It teaches us nothing of the health or disease of the kidneys, for three-fourths of the total kidney-tissue may be destroyed and yet the remaining one-fourth will be sufficient to maintain the normal molecular concentration of the blood; nor does it afford an indication of their potential functioning power. Only in connection with the health or disease of the individual organs can the freezing-point of the blood be considered as a help in this latter respect. Thus, if one kidney is diseased and the other is healthy or not much affected a normal freezing-point of the blood would point to a potential functional sufficiency of the latter and would permit of our removing the diseased organ. But an abnormally depressed freezing-point is not under these conditions to be construed as evidence of the potential insufficiency of the remaining kidney and therefore to speak against the advisability of doing nephrectomy. Furthermore, if the separately collected urines show that both organs are more or less extensively affected, a normal cryoscopic index of the blood is not proof of the potential functional sufficiency of either organ, and in such cases we should refrain

from nephrectomy or from any severe operation upon the kidney parenchyma even though the freezing-point of the blood is normal.

The relation of the cryoscopic index of the blood to the potential function of the kidneys may be summed up as follows:

(1) A normal cryoscopic index of the blood when there is one healthy and one diseased kidney would indicate a potentially sufficient functional capacity of the sound organ and would warrant us in doing a nephrectomy.

(5) An abnormally low cryoscopic index of the blood when there is one healthy and one diseased kidney does not indicate potential insufficiency of the former for the function of this organ may be only temporarily impaired by the diseased fellow organ. In such cases nephrectomy may nevertheless be done safely.

(3) A normal cryoscopic index of the blood when there is one slightly diseased and one extensively diseased organ would usually point to a potentially sufficient functional capacity of the less diseased organ and would allow of our doing a nephrectomy or other operation upon the more affected kidney.

(4) A normal cryoscopic index of the blood when there is more or less extensive affection of both kidneys does *not* mean a potentially sufficient functional capacity of these organs, and does not permit of our removing one or even of incisively attacking either organ.. And, finally,

(5) An abnormally low cryoscopic index of the blood with more or less extensive disease of both kidneys indicates their potential insufficiency and strongly speaks against the advisability of doing any operation upon them.

The Cryoscopic Examination of the Urine.—The molecular concentration of the urine varying as it does normally between wide limits according to the functional activity of the kidneys, their nervous and circulatory conditions, and the amount of fluid that is ingested, causes its freezing-point to likewise fluctuate considerably. This makes the cryoscopic index of the urine of less value as an indication of the secretory activity of the kidneys.

The urine of healthy kidneys, under normal conditions of circulation and nervous influence, and moderate ingestion of fluids, freezes at 1.2° C. to 2.2° C. below distilled water. With renal insufficiency less molecules are eliminated from the blood and consequently the molecular concentration of the urine,—*i.e.*, the number of molecules it contains in solution diminishes and its freezing-point consequently rises,—*i.e.*, approaches nearer to that of distilled water. If after moderate ingestion of fluids and with no disturbed circulatory or nervous condition the freezing-point of the urine is less than 1° C. below that of distilled water, renal insufficiency may be assumed.

The cryoscopic index of the separated urines affords a clue to the functional activity of the individual organs. For if we compare the freezing-points of the separated urines, collected at the same time and under the same circulatory and nervous conditions, we can gain an idea of what proportion of the combined kidney work each organ is doing; and further, as the work which is performed depends largely on the amount of secreting tissue in the organ, we may by a comparison of the freezing-points of the separate urines ascertain the extent of disease in each kidney.

The combined individual functional activity of the kidneys can also be determined by estimating the percentage of urea in the combined urines and individual urines respectively. A healthy individual being on a mixed diet, and doing an average amount of exercise and work eliminates about 500 grains of urea in the twenty-four hours; patients in bed and on a fluid diet eliminate about 300–400 grains in the twenty-four hours. Any marked decrease below 300 grains per diem is to be taken as an indication of impaired functional activity of the kidneys. The comparison of the percentage of urea in the separated urines, just as the comparison of the cryoscopic index of the separated urines furnishes an indication of what proportion of the combined work each kidney is doing, and likewise enables us to draw an inference as to whether both organs are diseased, and if so which is the more extensively involved.

The comparative value of these methods for determining the functional activity of the kidneys is not at all settled. Casper and Kümmel maintain that the cryoscopic index of the blood and of the combined and separate urines furnishes the best indication of the functional activity of the kidneys, whereas Israel, Rovsing and others insist that these methods for determining the kidney function are altogether too uncertain and too unreliable. Rovsing depends upon the urea percentage in the combined and separated urines as an indication of the amount of work that is being done, and upon the analysis of the urine for evidence of the health or disease of the kidneys. He maintains that a kidney which secretes healthy urine, containing a normal percentage of urea, is functionally sufficient, and can be relied upon to satisfactorily perform the work of the body.

Casper and especially Kümmel would reject all cases for nephrectomy or major operation in which the freezing-point of the blood is below 60° C. But this arbitrary practise is as has been shown above, entirely unwarranted. Thus the writer has had several cases recover after nephrectomy, in which the freezing-point of the blood was below 0.60° C.,—*i.e.*, 0.63° , 0.65° , 0.67° C., and other surgeons have had similar experiences. On the other hand, it is wrong to entirely reject, as Israel and Rovsing do, the evidence of kidney function that cryoscopic examination of the blood and of the combined and separate urines furnishes. The data these afford, viewed in the proper light, are additional evidence of the work the renal organs are doing and of their potential functional power. There can be no doubt that the best results will be obtained if all the methods are used.

The practise of the writer is to catheterize both ureters and collect the urine separately from each kidney. This is then carefully examined. The cryoscopic index of the blood and of the separated urines, and the percentage of urea in the combined and separated urines is then ascertained and by study and comparison of the data thus afforded no difficulty is experienced in determining the health or disease of the individual

organs, their combined and individual functional capacity, and the extent of the disease in each organ.

The phloridzin and methylene blue tests for the determination of the functional capacity of the kidneys have the same underlying principles as the cryoscopic index and urea percentage of the individual urines. Of the two the phloridzin is the more rapid and reliable. These tests rest upon the fact that after a subcutaneous injection of phloridzin sugar is eliminated in the urine and after a hypodermic injection of methylene blue various chromogen bodies are excreted in the urine. To carry out the tests both ureters are simultaneously catheterized and then 0.005 gm. of phloridzin, or 0.05 gm. of methylene blue are injected subcutaneously. As healthy organs are supposed to eliminate from phloridzin and methylene blue the same amount of sugar and chromogen respectively in the same time, a comparison of the percentage of sugar or chromogen which is eliminated by each kidney during the same period should enable us to determine the extent of disease in each organ and the amount of working parenchyma which is present.

In the methylene blue test it is likewise important to determine the time the chromogen first appears in each urine, and the rapidity and duration of its elimination.

Neither of these last tests can be relied upon for determining the health or disease of the kidneys, nor do they afford reliable data of the potential functional power of these organs, or of their actual work.

URETERAL CALCULUS.

WITH A REPORT OF FIVE CASES.¹

BY JOHN B. DEEVER, M.D.,

OF PHILADELPHIA,

Surgeon in Chief, German Hospital.

A SURGEON who is called to operate upon five patients suffering from ureteral calculus within as many months, has his attention somewhat forcibly drawn to the importance of diagnosis, and to the difficulties of treatment of this class of cases. In former years calculi arrested in the ureter were considered rare, but since more accurate methods of making a diagnosis in urinary surgery have been available, the frequency with which this condition is present has become more widely appreciated. According to Dr. C. L. Leonard ¹ the use of the Röntgen rays has proved the ratio of ureteral to renal calculi to be as 66 is to 33 in cases where the diagnosis has not been confirmed by operation or recovery of the stone, and as 44 is to 29 in cases where the X-ray diagnosis has been thus confirmed.

Renal calculi in their descent to the bladder are prone to be arrested at three points in their course: (1) Two inches from the pelvis of the kidney, as the ureter bends forward over the psoas muscle; (2) at the brim of the pelvis, where it dips down across the bifurcation of the common iliac artery; and (3) close to the vesical orifice of the ureter. The normal ureter is said to be one-seventh of an inch in diameter at the upper, one-fourth of an inch at the middle, and only one-tenth of an inch in diameter at the lower constriction. In the 44 cases of ureteral calculus referred to by Morris ² the stone was arrested at the upper constriction in 19 instances, at the pelvic brim in ten and at the vesical extremity of the ureter in 15. These figures

¹ Read before Philadelphia Academy of Surgery, February 5, 1906.

correspond very closely to those given by Bovee,³ who collected 64 operations in which an impacted calculus was removed from the ureter by the extraperitoneal route. Among these, 22 were found near the upper constriction, 17 at the pelvic brim, and 18 close to the bladder; while the remaining stones were found at other portions of the ureter.

The symptoms produced by the passage of a renal calculus are sufficiently familiar, and it only remains, after such symptoms have arisen and have subsided, to determine whether the stone has been forced back into the pelvis of the kidney, has been discharged into the bladder, or whether it has been arrested at some point in its journey. If it escapes into the bladder, symptoms of vesical calculus arise; and if the stone remains in the kidney those of renal calculus continue. The point that chiefly concerns us is to determine at what point of the ureter the stone has lodged. This is not always possible from the symptoms alone. Indeed Mr. Freyer⁴ asserts that the symptoms produced by ureteral calculus are precisely those of renal calculus, except when the stone is lodged in the lower end of the ureter, within an inch or so of the bladder. He admits indeed that tenderness at the seat of impaction may be a guide, but claims that the Röntgen rays are even less satisfactory than in cases of renal calculus. Although I cannot entirely agree with his premises, I heartily endorse his conclusion, which is that the rule of surgery in doubtful cases is to first explore the kidney through the loin, and to pass a sound down the ureter before concluding the operation. If a stone is found in the ureter the wound should be enlarged, and the calculus extracted by appropriate means.

It appears to me, that tenderness at the seat of impaction and the information gained by a technically perfect skiagram, are two very valuable aids to diagnosis. From the symptoms alone it may be possible to determine that renal calculus has existed, and that a calculus is still present, either in the kidney or in the ureter, or in both. It is because we cannot be certain that not more than one calculus is present, that it becomes

necessary to make sure that none is overlooked in the kidney even after the stone found in the ureter has been extracted.

A skiagram to be of value in these cases must throw a shadow of structures less dense than the least dense calculus; and as phosphatic and uric acid stones are by no means dense, it is necessary to see the shadows of the psoas muscle, to make sure that no calculus is present.

If after an attack of renal colic symptoms of renal calculus persist, we may be certain that the stone has at any rate not travelled as far as the lower ureter. In the latter case the symptoms of vesical calculus arise, and though no calculus can be found in the bladder, its location may usually be detected by rectal palpation or by cystoscopic examination.

Although a calculus may remain lodged in the ureter indefinitely without producing serious symptoms, yet such cases are exceptional and were such a calculus to be discovered by chance, it is questionable whether it would not be the surgeon's duty to remove it as a prophylactic measure. Leonard⁵ refers to 26 calculi, found as it were by accident, impacted in the ureter, all of which were safely passed into the bladder while the patients remained under medical care. Cabot⁶ thinks highly of massage in such cases as an aid to the descent of the stone. But it seems to me that the dangers which may ensue from neglect of ureteral calculus are greater than those which attend its removal by operation. Among 21 operations mentioned by Fowler⁷ there were only three deaths; and in reviewing the literature of the last couple of years while preparing this paper, records of 25 operations for ureteral calculus have been found, many of them not in Fowler's list, with only 2 deaths—one in a patient with recurrent carcinoma of the ureter, and the other in my own patient, to be presently mentioned.

If the stone is rough and mammillated it is more apt to excite ulceration and inflammation, although less apt to absolutely occlude the ureter than a smooth stone. On the other hand, while a small stone may be more easily passed by ure-

teral peristalsis and by the *vis a tergo* of the kidney's excretion, yet if it does become arrested it is almost certain to cause hydronephrosis, and give rise to serious symptoms in a short time. When such cases are seen before marked infection is present, the mortality from the operation is slight, as the kidney does not then require removal. The condition of the kidney is really, I think, the main point upon which the success of treatment must depend. In the only one of my cases which terminated fatally, there were calculi impacted in both ureters and the operation which removed the stone from the left ureter was unsuccessful because of the diseased condition of the right, which was not known until the post-mortem examination.

The route to be chosen for the removal of the stone is a matter of much importance. If the stone is known to be near the bladder, it is usually most successfully removed intravesically. In the female the vaginal route has been employed, and the ureter exposed within the layers of the broad ligament. This appears to be less satisfactory a method than the intravesical, and the same may be said of the perineal route in the male. In the female the urethra can be dilated sufficiently to admit suitable forceps, or even the finger, and, after slightly incising the vesical orifice of the ureter, the calculus can usually be extracted without much difficulty. This plan obviates the possibility of a vesico-vaginal or uretero-vaginal fistula, which is not very remote when the vaginal route is chosen. In one of Freyer's patients the ureter was exposed by incising the vagina, but the stone slipped further up the ureter and could not be extracted. It was, however, found in the dressings on the following day; but the patient developed pelvic cellulitis, had a very slow convalescence, and when last seen still suffered from kidney symptoms. In the case of a patient where intravesical manipulations had failed to dislodge the stone, Millet⁸ succeeded in evaginating the obstructed ureteral outlet through the dilated urethra, by means of one finger within the bladder and another in the vagina. With the

parts thus under full control he was able to remove the calculus with success. Crawford⁹ successfully removed from a male patient a calculus measuring one and three-eighth inches in diameter by intravesical dilatation of the ureter. In the third case recorded to-night I found it impossible to extract the stone extraperitoneally, and accordingly opened the bladder above the pubes, and by slightly incising the ureter was enabled to deliver the stone into the bladder and successfully remove it.

But this means will not suffice unless the calculus is lodged very close to the vesical orifice of the ureter; and for those stones impacted more than an inch away from the bladder wall, I would strongly recommend the extraperitoneal operation. This is of course the route selected in cases where the location of the calculus is doubtful, since it affords access to practically the entire length of the urinary tract. In enlarging the lumbar incision downwards care should be taken not to injure the spermatic cord, and at the conclusion of the operation the anterior abdominal wall should be repaired as after an operation for ventral hernia. Even in a child of 3 years Betham Robinson¹⁰ exposed, extraperitoneally, the ureter close to the bladder wall and successfully removed the impacted calculus.

As the peritoneum is stripped back from the iliac fossa, it carries the ureter along with it, and this structure is therefore to be sought on the vesical side of the wound. Proper knowledge of pelvic anatomy is essential to the operation. When a stone is exposed in the ureter, it is proper to try to dislodge it, and to push it either upward into the pelvis of the kidney, or down into the bladder. In doubtful cases, where the kidney alone is first exposed, it may be possible to push the calculus on into the bladder by a bougie, or even to extract it through the kidney by means of the urethral forceps. If it can be pushed on into the bladder it can be satisfactorily removed by the evacuator.

An incision into the ureter itself is usually to be avoided, although in my own opinion the probability of a permanent urinary fistula remaining is exaggerated. But an incision

through the renal cortex, or one directly into the pelvis of the kidney, is to be preferred, since the tract required for drainage is shorter, and the wound may be more closely sutured. But if the calculus cannot be dislodged, it is safer to incise the ureter than to attempt to crush the stone *in situ*. If the calculus is oxalate of lime it may be impossible to crush it, without so injuring the ureter as to cause sloughing; and even if it could be successfully crushed, the detritus would be very likely to give rise to very serious trouble before being completely evacuated. The plan adopted by Mitchell¹¹ and by Corson¹² of placing sutures before extracting the stone, thus using the calculus as a bobbin, may prove advantageous when the wound is deep. It has been my practice to employ when possible two rows of sutures, the first, of catgut, for the submucous tissues, and another of silk, and of the Lembert type, for the muscular walls of the ureter. This plan I am convinced decreases the probability of a urinary fistula persisting. Fiori¹³ has recently recorded a remarkable operation in which he exposed the ureter extraperitoneally, split it for a distance of sixteen centimetres (12 centimetres in its abdominal and 4 centimetres in its pelvic portion) and thus succeeded in extracting 11 or 12 small calculi, the largest weighing 5 grammes, being impacted close to the bladder. He then reconstructed the ureter by sutures using a sound as a guide; and had the satisfaction to have the urinary fistula which resulted close a few days after the operation. Although, as he acknowledges, it was a difficult and somewhat hazardous operation, yet the event justifies his course of action in preferring uretero-lithotomy to nephrectomy, which would have been the only alternative.

Finally, a word may be said about the occurrence of carcinoma in the ureter, as the result of calculus disease. One of the patients I operated on showed the presence of carcinoma in the ureter immediately above the site of impaction, but this would probably have escaped detection if the kidney had not been so diseased as to require removal, and hence to allow a microscopical study to be made of the entire specimen.

Primary cancer of the ureter is admittedly rare. Metcalf and Safford¹⁴ only one year ago were unable to find more than 7 authentic cases on record, including one of their own; and in a majority of these cases no calculus was present. It is probable that most cases of cancer of the ureter have escaped detection, and that as operations on the ureter are more frequently performed, such changes will be more often found. The mere possibility of malignant changes occurring, however, only serves to emphasize the need of prompt removal of the calculus.

The following cases of ureteral calculus are reported with the hope of exciting discussion among the fellows; and among some of the unsettled points on which I am anxious to learn their views, I would particularly mention the following:

The value of the X-ray and the cystoscope with bougieing of the ureter in diagnosis; the significance of localized tenderness. The propriety of exploring the ureter intraperitoneally to locate the suspected stone.

The question of removal of quiescent or latent stones.

The best route for the removal of juxta-vesical stones: whether perineal, vaginal, intravesical, suprapubic, or extra-peritoneal.

The proper treatment of the stone when found: whether it should be pushed on into the bladder, should be crushed, or whether the ureter should be incised.

The best method of suturing the ureter.

Whether nephrectomy is to be countenanced, except for incurable disease.

All of the following cases were operated upon in the German Hospital:

CASE I.—*Ureteral Calculi (Impacted) Removal.*—Miss —, white, aged 22. Admitted July 24, 1905. For past two years has complained of pain in right kidney region, referred downward into inguinal region; pain almost constant, but has had three attacks of severe pain at intervals of six months; duration seven to fourteen days, always accompanied by nausea, vomiting and dizziness.

Abdominal examination. Right kidney movable, not enlarged, no distention or rigidity, no tenderness over abdomen. No X-ray taken.

Operation; July 25, 1905. Vertical incision right ileocostal space; pelvis of the kidney found to be the seat of small hydronephrosis, about the size of a lemon; ureter found dilated to the size of the little finger. The ureter was incised and the fluid allowed to escape, a probe was introduced and a stone palpated; after much effort the stone was brought upwards and delivered through the opening in the ureter at the pelvis of the kidney. Discharged, cured, August 21, 1905.

CASE II.—*Nephrolithiasis Double. Impacted calculi both Ureters.* Mr.—, white, aged 33. Admitted September 7, 1905. On day of admission was seized with sudden acute pain in left lumbar region radiating from near crest of the ileum to the left testicle, testicle retracted. The patient was nauseated, suffered from frequent urination, passing large quantities. Abdomen soft, no rigidity, no pain on pressure over left kidney or course of ureter. No palpable mass. X-ray; dense shadow in region of right kidney.

Operation, Sept. 9, 1905. Oblique incision left flank.

Calculus found impacted in ureter 3 cm. below the pelvis of the left kidney. An effort was made to work the stone up into the pelvis, but failed; the kidney was delivered and an incision made horizontally to the poles into the pelvis and scoop and forceps used to deliver the stone, but failed. On palpation the stone was felt in previous location; an incision was made in the long axis of the ureter over the calculus and the same delivered. The stone was the size of a small pea, irregular and very hard. Before suturing the ureter a probe was passed into the bladder. This patient did well for three weeks, when he was seized with severe pain in the right loin and in a very short time became anuric and died October 10, 1905. Autopsy showed an impacted stone in the right ureter.

CASE. III.—*Urethral Calculus. Suprapubic Urethrolithotomy and Lumbar Incision.*—Mr.—, white aged 49. Admitted October 16, 1905. In 1896 was operated for acute appendicitis. In January, 1905, was seized with severe pain in right side referred downward to the right groin. Was operated for abdominal adhesions in June, 1905, but not relieved.

Present illness: Pain is paroxysmal, coming on suddenly at any time, beginning apparently in the right inguinal canal and referred to the right kidney. These attacks are followed almost immediately by vomiting, requiring morphine for relief, but are not followed by irritability of the bladder.

Abdominal examination: Tenderness on pressure at a point on the semilunar line opposite the anterior superior spine. X-ray showed large dense shadow in region of the kidney, and small one near bladder.

Operation October 30, 1905. Curved oblique incision right lumbar region to the anterior spine of the ilium. A stone was located in the ureter in the wall of the bladder. After many attempts to dislodge the stone either into the bladder or by drawing it up into the ureter, all of which were unsuccessful, the wound was covered and the patient placed in the dorsal position and the bladder opened suprapubically; the vesical orifice of the ureter was incised slightly and by pressure from behind the stone was finally brought into view and delivered. The stone was the size of a split pea and very hard. The suprapubic fistula closed on the eighteenth day. Patient was discharged cured November 25, 1905.

CASE. IV.—*Ureteral Calculus*.—Mrs. —, white, aged 32. Admitted November 21, 1905. Patient states that at the age of 21 she had an acute attack of epigastric pain, with vomiting; this attack lasted for one or two days and was associated with severe headache. Had a similar attack six years ago, lasting three days. Patient never vomited blood, always biliary material.

Present history dates back five years, when patient began to suffer with acute pain in the left iliac region radiating to the right loin and back; pain was so acute that anodyne was used for its relief. These attacks occurred at intervals from one to two attacks each month. For one year the patient was free from these attacks.

Six weeks before admission to the hospital attacks of very acute pain, beginning in the right iliac region, radiating to the right lumbar region, occurred every day or night. Large doses of morphine were used for these attacks. Patient was never jaundiced, never noticed blood in the urine.

Upon examination, the right kidney was palpable and mov-

able; left kidney not palpable; no tenderness elicited over either right or left iliac region.

X-ray; dense shadow in region of right kidney, formed body.

Operation, November 25, 1905. Incision right flank, kidney exposed. A stone was found in the ureter. Stone was removed and the kidney, being diseased beyond operative repair, was also removed. Patient was discharged cured December 14, 1905.

CASE V.—*Calculus in Right Ureter*.—Miss —, white. History of right renal colic for five years. Nothing of note in family or personal history other than attacks above referred to. Point of tenderness a little above the line of the right anterior superior spine of the ilium very decided; upon one occasion this tenderness suggested to the mind of the medical attendant the probability of inflammation of the appendix; this was ruled out, however. X-ray, negative.

Operation revealed a stone in the right ureter three inches below the pelvis of the ureter, with stricture of the ureter to the extent of one inch, through which it was difficult to pass the smallest probe. After incising the ureter above the stricture the stone was removed. The ureter between the stricture and the kidney was dilated to the size of the little finger. The kidney was so diseased that it was removed. The patient made an uneventful recovery. Microscopical examination of the ureter showed clearly carcinomatous change.

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THE TRANSPERITONEAL EXAMINATION OF THE URETER IN CASES OF SUSPECTED URETERAL CALCULUS, AND THE COMBINED INTRA- AND EXTRA-PERITONEAL URETERO-LITHOTOMY.¹

BY JOHN H. GIBBON, M.D.,

OF PHILADELPHIA,

Associate Professor of Surgery in the Jefferson Medical College ; Surgeon to the Pennsylvania Hospital.

DURING my recent service at the Pennsylvania Hospital I had three cases which illustrate well certain advantages to be derived from the transperitoneal examination of the ureter and the necessity for a thorough palpation of the ureter when the abdomen is opened for lesions of other organs, and especially for the less acute varieties of appendicitis. Before enumerating these advantages a brief report will be made of two cases of ureteral calculus in which the stone was located by transperitoneal palpation and removed by combined intra- and extra-peritoneal uretero-lithotomy and of a third case in which ureteral calculus was suspected but not found and yet in which the real lesion, a cystic kidney, was detected.

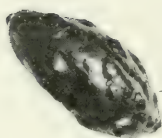
CASE I.—An Italian, 39 years of age, male, admitted to the Pennsylvania Hospital on August 3, 1905. The patient spoke English very badly but was sent in by his physician as a case of subsiding appendicitis. He gave a history of repeated attacks of pain in the abdomen, accompanied by vomiting and diarrhoea. The attacks lasted for three or four days, when he was able to get up and go about. Until the present attack he had been well for a year. The present attack had lasted for three or four days and was accompanied by vomiting. Excepting for some slight tenderness in the right iliac fossa the patient at the time of his admission was free of symptoms. There was no tenderness over the kidney and he complained of no urinary symptoms; there con-

¹ Read before the Philadelphia Academy of Surgery, February 5, 1906.





b



a

Ureteral calculi, exact size; a, Case I; b, Case II.

tinued a persistent tenderness on deep pressure in the right iliac fossa. He improved so much in a few days and the tenderness was so slight that my first inclination was to allow him to go out and return later if he had another attack. In other words, I was not prepared to accept the diagnosis of appendicitis. In view of the history, however, I concluded to operate. The patient's urine showed a number of red-blood corpuscles. Under choride of ethyl-ether narcosis I operated on the 8th of August. The abdomen was opened through the right rectus and when searching for the appendix my finger came in contact with a hard mass just below the iliac vessels in the true pelvis. It seemed about the size of a hazelnut, was very hard, and at first immovable. Although shaped like a gland it was hard and there were no other glands enlarged. As it was in the line of the ureter I concluded it was probably a ureteral stone. I left it for further investigation and proceeded to examine the appendix. This organ showed evidences of an old inflammation, the vessels over it being very tortuous and there being numerous adhesions all about it excepting at the extremity. These adhesions bled quite freely when divided. The appendix stump was crushed with forceps and inverted by a purse-string suture of gut. In order to make a more thorough examination of the small mass in the pelvis I enlarged my incision downwards through the rectus. I was then able to determine that the mass was a stone in the ureter and decided to remove it extraperitoneally without however making another incision through the abdominal wall. The original incision was further increased downwards and the peritoneum stripped from the abdominal and pelvic wall down to the ureter. With one finger in the pelvic cavity I was able to push the ureter and stone up into the extraperitoneal wound within easy reach, but not within sight. I then opened the ureter longitudinally and removed a long, black stone about the size of the end of the little finger and cucumber shaped. In order to remove the stone quite a large opening was made in the ureter. A gauze drain was then passed down to the opening in the ureter and the peritoneal cavity was tightly closed with a continuous gut suture. The upper portion of the wound in the rectus was closed with sutures through its fascia. The superficial tissues were closed excepting at the lower end of the wound, where the gauze drain made its exit. In

spite of the flow of urine through the gauze, which was quite profuse for about two weeks, the abdominal wound healed without any infection. On the 2d of September very little urine was discharged from the sinus, and on the 6th of September the sinus was closed. It opened later, however, for a short time, but closed again.

CASE II.—A domestic, aged 32, was admitted to the Pennsylvania Hospital, August 12, 1905. This patient was sent into the hospital at night as a case of appendicitis and was seen in my absence, by Dr. Francis T. Stewart. Dr. Stewart did not think the case one of appendicitis or one demanding immediate operation. I saw her the next day and could not make up my mind that there was any inflammation of the appendix. She gave a history of repeated attacks of pain in the right side of the abdomen in the appendiceal region, accompanied by vomiting. The pain was more or less fixed, there being no radiation to the back or to the bladder: there were no urinary symptoms. The examination of the urine, however, on the day after admission showed a few red-blood corpuscles and a trace of albumin. Repeated examinations of the urine continued to show red-blood corpuscles. Examination of the abdomen the day after admission showed considerable tenderness over the right kidney. This, however, disappeared and the only tenderness was in the iliac region. A few days later the patient passed both blood and mucus by the bowel and the cæcum and sigmoid were quite tender. These symptoms did not persist, as did the microscopic blood in the urine. A differential diagnosis between appendicitis, colitis, renal calculus and ureteral calculus had to be made. With the disappearance of the renal tenderness and of the blood and mucus in the bowel movements, and in view of the absence of the characteristic symptoms of appendicitis, I made a diagnosis of a probable ureteral calculus on August 30th, and advised operation. This diagnosis was based on the continued tenderness in the iliac region, the repeated attacks of pain accompanied by slight rises of temperature, and especially the microscopic blood in the urine. Urinary symptoms were absent in this case, as in the previous one; there was no frequency of micturition and no pain in the bladder. The right kidney was not movable. The menses had been irregular and painful. I determined to follow the same

technique as in the previous case, especially as I was in some doubt regarding the diagnosis. Therefore, on the 31st of August under ethyl chloride-ether anæsthesia the abdomen was opened through the outer edge of the right rectus, low down, the appendix being readily found and removed as in the previous case; it was perfectly normal. The ureter, which was thickened, was easily felt crossing the iliac vessels. About one inch below the vessels a hard, small, immovable mass was felt. The peritoneum was stripped away from the abdominal and pelvic walls after increasing the incision downwards. The ureter was exposed and brought plainly into view. Great assistance was also derived in this case from a finger within the pelvis pushing the ureter up into the extraperitoneal wound. The ureter was incised longitudinally and a small irregular stone, very rough and adherent to the ureteral mucous membrane, was removed. A gauze drain was inserted down to the ureteral wound, the peritoneal cavity was closed, and all but the lower portion of the wound in the abdominal wall. Although in this case a smaller incision in the ureter was required than in the previous one, there was a greater and more prolonged leakage of urine. The abdominal wound healed promptly excepting at the point of drainage, and the patient never had an abdominal symptom. On September 30th, one month after the operation, there was no flow of urine, there was, however, some discharge from the drainage tract which remained open for about two weeks. The patient was discharged on November 29th, the wound having remained closed for about a week.

CASE III.—A man, aged 22, admitted to the Pennsylvania Hospital, December 21, 1905. This patient had been in the hospital a number of times, once for typhoid fever, again in December, 1903, for an appendiceal abscess which was operated upon by Dr. Le Conte: in February, 1904, he was again admitted suffering from attacks of pain which seemed to indicate a renal calculus. At this time Dr. Harte explored the left kidney but found no stone. Upon his last admission the patient stated that since his last operation he had had attacks of pain coming on every few weeks. The character of the pain was much the same as in his previous attacks and was accompanied by nausea and vomiting and fever. At the time of his admission he was suffering con-

siderable pain and had some temperature. This promptly subsided and he was quite comfortable the next day. When examined there was considerable tenderness in the left lower abdomen and the pain extended down to the bladder and into the left lumbar region. Later, the tenderness seemed more marked over the kidney and ureter. The tenderness over the kidney gradually disappeared but that in the left iliac region and in the course of the ureter remained. On admission there were a few red-blood corpuscles in the urine, but these were not found at any of the subsequent examinations. As the kidney had been thoroughly explored only ten months before and as the tenderness persisted over the ureter, I determined to explore this organ. As there was nothing to indicate the exact situation of the supposed stone I determined to open the abdomen as in the two previous cases and thoroughly palpate the entire urinary tract. On December 30th, under ethyl chloride-ether anæsthesia, I made an incision through the left semilunar line into the abdominal cavity. I had no difficulty in finding the ureter and tracing it from the bladder to the kidney. It was normal in size and there was no evidence of any stone. The right ureter also could be felt in its lower portion and there was nothing abnormal about it. I had previously examined the bladder for stone with a negative result. On palpating the kidney through the wound I discovered it to be enlarged and cystic. The patient was turned on his abdomen, the kidney exposed through a straight incision in the lumbar region, and removed. During the separation of the kidney from the peritoneum I kept one hand in the abdominal wound as a guide. This greatly facilitated the separation of the kidney, which was densely adherent at its lower pole to the colon and peritoneum. The abdominal wound was closed before the nephrectomy was completed. Several of the cysts were ruptured before the kidney was delivered but not before the abdominal wound was closed. The fluid in the kidney did not have an ammoniacal odor and was of a milky consistency. The whole kidney was a mass of large cysts. The pedicle was ligated *en masse* and the individual vessels tied with smaller gut. A small drain was inserted. The patient's convalescence was perfect, excepting for a severe pneumonia which he developed promptly after the operation. It is interesting to note that this pneumonia

occurred in the right lung. A few days after the operation he was passing as much as sixty-five ounces of urine. There was no doubt from the examination of the kidney and from the character of its contents that the right kidney was secreting all the urine passed at the time the operation was done.

Palpation of the ureter through an abdominal wound is nothing new. I have for some time made it a routine procedure in all cases where the abdomen is opened for other conditions and where these conditions do not seem to be sufficient to account for all the symptoms, and I am especially careful to do this in all interval operations for appendicitis. Although never generally advocated, the immediate removal of a stone detected by palpation through the abdomen has been practiced, yet, so far as I can learn, the removal has been done through the peritoneum or through one of the various extraperitoneal incisions, such as the lumbar, iliac, inguinal, sacral, vaginal or rectal. I believe then that the practice in the two cases reported by me of the removal of the stone extraperitoneally but through the same incision in the abdominal wall, and while the abdominal wound remained open, has not before been employed. Most authorities recommend the closure of the peritoneal cavity and the making of another incision for the extraperitoneal exposure and removal of the stone. In the two cases just described there was no doubt of the great advantages to be derived from having a finger in the peritoneal cavity and on the stone during the exposure of the ureter in the extraperitoneal portion of the wound. An objection to this method which naturally presents itself is the danger of infection of the peritoneum, but in neither of my cases did this occur and if the operator hesitates to open the ureter while the peritoneal wound is still open he can easily close the latter after the thorough exposure of the ureter; he will then have had all the advantage of the finger in the abdomen during the exposure of the ureter and the location of the stone. With a certain amount of care, however, I know that infection of the peritoneal cavity can be avoided, and moreover that the exposure of the ureter and extraction

of the stone are easier and accompanied by less injury of the ureter itself when the operator has the assistance of a finger in the pelvis pushing the stone and ureter up into the extraperitoneal wound.

Another advantage to be derived from the manipulation both within and outside the peritoneum is the fact that in this way the ureteral stone can be more easily forced into the bladder if this is thought possible or back into the dilated ureter where an incision is apt to close earlier and better than at the site where the stone has been arrested. Case III illustrates the advantage of intraperitoneal examination of the ureter, even when no stone is present. It enabled me in this case to detect a cystic kidney on the left side which I would not have been able to diagnose by palpation until it had reached much greater size. In a certain number of cases of stone in the lower portion of the ureter it is difficult to determine in which ureter the stone is. In such cases localization through an abdominal incision is strongly recommended.

From the limited experience gained by these two cases I am not prepared to advise the removal of every ureteral stone by the combined intra- and extraperitoneal method, but in all doubtful cases and in all cases where a stone is found in a ureter when the abdomen has been opened for some other condition I do advocate its immediate removal either through a separate incision or after the manner just described. To remove these stones through the peritoneum is seldom justifiable, as the risks of a peritonitis are too great.

In neither of the above cases was the ureter sutured. I felt that the wound would close after simple drainage just as the common duct closes after the removal of a stone. In any future cases, however, I think I shall close the incision in the ureter and introduce a drain down to the sutures. Henry Morris states in this connection that suture of the ureter is of doubtful utility when it is much damaged and that it may be harmful.

I would urge the careful palpation of the ureter in all cases where the abdomen is opened for chronic or subacute inflammation of the appendix or uterine appendages. And also that where nephrotomy is done for stone, whether a stone is found or not, a thorough examination of the ureter, by means of a ureteral probe, should be made. One of the great objections to the use of the ureteral probe through the bladder is the difficulty of catheterizing the ureters in the male, and the further difficulty of differentiating a stone from some other form of obstruction, such as a kink or stricture. The presence of microscopic blood in urine, especially after an attack of pain, is of great diagnostic value.

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THE X-RAY FINDINGS IN A CASE OF GRITTI-STOKES AMPUTATION.¹

BY EUGENE R. CORSON, M.D.,

OF SAVANNAH, GA.

I AM not aware that there has been any X-ray study of the results obtained in the Gritti-Stokes amputation, with any definite information as to the ultimate relationship between the sawed patella and the lower end of the femur. Gritti's original object was to give a good bony cap to the lower end of the femur, forming a symmetrically rounded stump, well adapted to stand pressure and support an artificial limb. Gritti's original operation was a transcondyloid amputation. This was modified by Sir William Stokes to a supracondyloid amputation. He argued, and quite correctly, I think, that the transcondyloid amputation did not allow the sawed surface of the patella to be applied to the sawed femur without strain on the patella and the tendon of the quadriceps, and that contact could not be maintained without a forced adjustment, aided by pegging or nailing the bones together. If, however, the section was made a half-inch or more above the condyles, the patella could easily be applied to the sawed surface of the femur without strain and with sufficient play in the tendon of the quadriceps to overcome the contractions of this powerful muscle.

Now I believe that after the healing of the stump it may be quite difficult, if not impossible, to determine without the X-ray the exact result as to bony union between the two bones. A mere fibrous union where the stump is covered by the dense and strong fascia in this region will hold the parts so firmly together as to make any separate movements of the bones quite impossible and give the impression of osseous union. Certainly in my own case which I present here, though exam-

¹ Paper read before the Georgia Medical Society, January 24, 1906.



Rotation of patella to femur following Gritti-Stokes amputation. Profile view—patella tilted out like the half-open lid of a box.



Frontal view—patella drawn $2\frac{1}{2}$ centimetres inward.

ined so soon after operation the parts seemed firmly united and gave me the impression that the patella was in place and that I should ultimately have osseous union between the two bones. The X-ray, however, showed me a quite different result.

The case in point was briefly this: A man of 62 years came to me with a carious right tibia, the result of a gun-shot injury to his leg in the battle of Fredericksburg, 41 years before. All that time he had dragged the leg about, always getting worse, until finally in despair he realized the necessity of an amputation. At operation the whole tibia was found to be diseased, and I made a supracondyloid amputation with a long anterior flap, applying the sawed under-surface of the patella to the sawed femur. There was no strain on the tendon of the quadriceps, and the sawed surfaces were easily brought in contact and held by a snug sewing of the fascia and tendons with chromicized gut. The stump healed in two weeks without pus. This operation gives a beautiful, symmetrical stump, with the line of union of the flaps posterior, and looking as though "born that way."

Now my X-ray shows that I failed to hold the patella in place, and that through the strong action of the powerful thigh muscle, it had been drawn two and a-half centimetres inwards, and in addition had been tilted up like the half-open lid of a box, producing the very results that Stokes had tried to overcome by his supracondyloid modification. Judging from the skiagraph I have not got a very symmetrical stump, but the external appearances do not show this displacement; the stump looks symmetrical and firm. Though the skiagraph was taken just before the patient left the hospital, too soon for complete bony union had the bones held their position, we can see at any rate the displacement of the patella through the strong action of the quadriceps femoris, and know positively that no bony union is possible.

The X-ray findings in this case have suggested to me the following points for consideration:

Is it desirable to get a bony union between the patella and femur if we have otherwise a symmetrical, well-shaped stump?

I am inclined to believe that a fibrous union with the patella well in place and acting as a sort of buffer is preferable to a bony union where it forms a mere bony knob to the femur. I cannot but believe, too, that unless the patella is held in place by nail or peg, a mere fibrous union is the rule and the osseous union the rare exception. With this belief and knowing the excellent results following this amputation, I should discard all radical efforts to obtain bony union. Really the retention of the patella in the anterior flap is desirable quite aside from its forming a bony cap to the end of the femur. It gives a body to the flap, which, with the strong fascia of the knee, aids in forming an admirable cover to the end of the femur and in the making of a symmetrical stump. Compare this flap with the ordinary skin-flap of the Cardan operation and its superiority becomes at once apparent.

Our efforts should be more towards keeping the patella in the midline than towards obtaining bony union. Kept in the midline, it acts as a buffer to the end of the femur, as well as a good bony pad to a stump in every way adapted to hold the artificial limb and to bear the weight of the body.

This operation has several good points to recommend it. The section is through a spongy bone which heals rapidly, and the medullary canal is not opened. The avoidance of the femoral muscles in cutting out the posterior flap, the tendons alone being cut which retract and obviate any further retraction of the tissues in the healing of the stump. And, finally, there are fewer vessels cut, the popliteal and some articular branches alone requiring ligature.

EPIPHYSEAL SEPARATION OF THE GREAT TROCHANTER, WITH REPORT OF A CASE.¹

BY C. O. THIENHAUS, M.D.,

OF MILWAUKEE, WIS.

EPIPHYSEAL separation of the great trochanter is of such rare occurrence, and at the same time seems to be so dangerous and serious an injury, that the contribution of every case is well worthy of consideration. Therefore the recording of the following case observed by the author seems amply justified:

Miss K., of Union Grove, Wis., aged 11, states that one afternoon in February, 1904, while leaving school, she was violently thrown down on the floor by a school-mate, who pushed unexpectedly from behind. During her fall she struck heavily upon her left hip. Although she felt considerable pain in the region of her left trochanter after the accident, she was able to limp home, a distance of about one mile. The following morning she was unable to arise from her bed, as every attempt to step on the left leg caused her great pain originating in the region of the left trochanter major and extending down to the knee. The physician who was called, made the diagnosis of contusion of the hip joint, and advised rest in bed for several days. Four weeks after the accident I saw the case in consultation with Dr. McCracken, of Union Grove, when the patient presented the following status:

The girl while lying in bed could move her affected leg in all directions without discomfort. Upon pressure, however, on the region of the great trochanter of her left leg, she experienced considerable pain. Passive motion of the leg did not reveal any abnormalities in the hip joint. When I asked the patient to get up and use her leg she was unable to do so, stating that it was impossible to step on the leg on account of pain originating in the region of the great trochanter, and extending to the inner side of

¹ Demonstrated before the Surgical Section of the American Medical Association, 1905.

her keee. While standing she was always inclined to rotate the leg inward and to hold it in a slightly flexed position as shown in figure 1. Not being able to reach any definite diagnosis I advised the taking of a Röntgenogram. This, as shown on plate No. 2, demonstrates that the patient was suffering from an incomplete separation of the epiphysis of the great trochanter. A small piece of bone seems to have been torn off from the lower portion of the trochanter.

A well-padded plaster bandage was then applied, with slight pressure on the trochanter. After absolute rest in bed for six weeks the bandage was removed, and active and passive motion begun cautiously and slowly. Complete recovery followed.

From a clinical standpoint epiphyseal separation of the great trochanter, usually occurring between the ages of 7-17 years, must be divided into two classes. First, those in which a complete separation of the epiphysis, including the periosteum and tendinous parts attached to the great trochanter, has taken place. This class seems to be most dangerous and oftentimes fatal. Second, those in which the great trochanter is separated from the body and neck of the bone, but no tearing of the periosteum and the tendinous portions has taken place. The author's case belongs to the second class.

The cause of the separation in our case was, as cited in most cases, direct violence to the trochanter by the fall upon the hip. Separation of the trochanter produced by traction of the muscles attached to the trochanter seems to be possible, but there is no certain case on record belonging to this class. Broca, in an article entitled "*Mécanisme des décollements épiphysaires*" (*Presse médicale*, Paris, March 4, 1905), coming to speak of the epiphyseal separations of the upper femur, says: "Pour les deux trochanters, l'arrachement musculaire est parfaitement possible, mais je n'en connais pas d'exemple."

On the great trochanter are inserted among other muscles the powerful gluteus medius and minimus muscles. The action of these muscles produced the pain in our patient by tearing

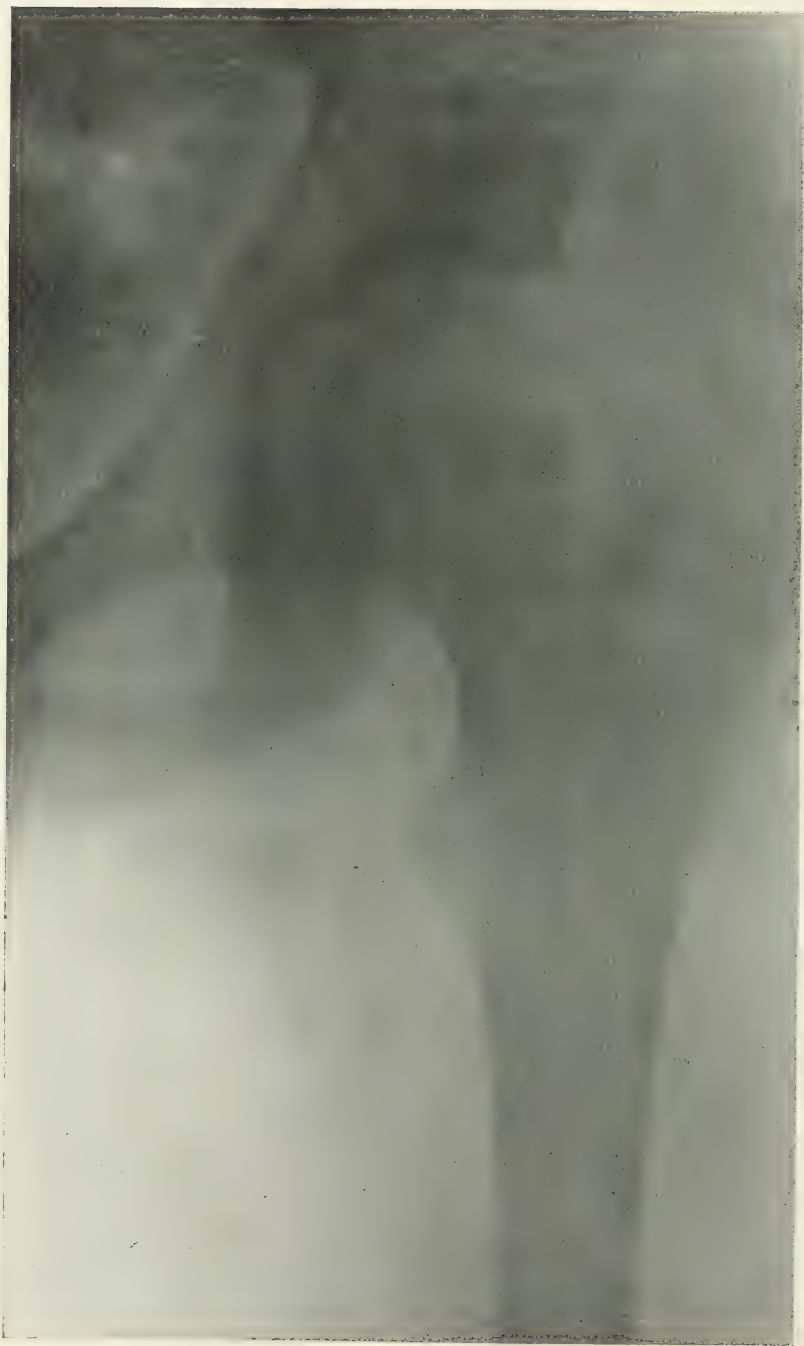


FIG. 2.—Incomplete epiphyseal separation of trochanter major. Op. 1904.

on the loosened trochanter during every attempt to step on the leg. Had there been forcible and excessive either active or passive motion immediately following the accident, these muscles would probably have succeeded in tearing off the trochanter entirely, thereby transforming the incomplete into a complete separation, and endangering the life of the patient.

John Poland (London), to whose excellent work on "Traumatic Separation of the Epiphyses," London, 1898, I owe most of my information and literature on the subject, could only collect 12 cases of epiphyseal separation of the great trochanter up to 1898. He cites, page 671, that from these 12 cases only 2, in which the condition was diagnosed during life, recovered. Of 6 cases 5 died from rapidly-developing suppuration and pyemia a few days following the accident. Death from other injuries resulted in 3 out of 12 cases.

The question naturally arises: Why is it that this injury is so fatal, and what are the reasons that at this place so much oftener suppurative processes take place after an epiphyseal separation than on other epiphyses of the body? In regard to this question, I would like to quote the opinion of Hamilton (*vide* Poland: "Traumatic Separation of the Epiphyses," p. 672), who says: "The cases reported would seem to show that in epiphyseal separation of this process there is a peculiar tendency to the formation of pus and of general pyemic infection, which may perhaps find its explanation in the great vascularity of the bony structure at this point, and in the fact that the lesion of this spongy tissue especially exposes the patient to the absorption of the septic materials."

To this Poland adds that "This cancellous tissue forming the base of the trochanter, which is in reality an apophysis, is certainly of a lighter and more spongy character than that in contact with the true epiphyses of the long bones. A considerable area of such structure is involved in this injury."

Since the review and collection of literature on this subject up to 1898 by Poland, I am unable to find another case cited.

In regard to diagnosis and treatment of epiphyseal separa-

tion of the great trochanter, it is not my intention here to dwell at length upon this subject, suffice it to again call the attention of the reader to the essay of this subject by Poland, in his work, "Traumatic Separation of the Epiphyses." For the purpose of completeness however, I may be allowed to give the following brief summary:

Diagnosis.—The differential diagnosis between contusion of the trochanter major and epiphyseal separation without displacement of the trochanter is almost impossible because of the insignificance of local symptoms, but let us bear in mind that in every case of direct violence against the trochanter, such as fall on the hip or severe blow on the trochanter, in young people from the seventh to the eighteenth year, the possibility of separation of the great trochanter must be taken into consideration. When we find at the same time pain by pressure on the region of the trochanter and inability of the patient to use the limb because of pain in the region of the hip joint extending down to the knee during attempts to walk, while at the same time active and passive motion in the hip joint is possible to all directions, the possibility of a separation of the great trochanter is still more probable. In such cases the physician should not be satisfied with the diagnosis of contusion of the hip joint, but an immediate skiagram should be taken to clear the diagnosis.

Even in case of complete separation of the trochanter with displacement, it is oftentimes impossible to feel the detached trochanter, displaced backwards, and upwards, on account of the accompanying swelling. The only definite means of a positive diagnosis even for those cases is a Röntgen Ray picture.

Treatment.—In every case in which there is any suspicion of epiphyseal separation of the great trochanter, absolute rest in bed is imperative, and in examining such cases for diagnosis the patient should be handled with the utmost care, especially avoiding forcible active and passive motions, which by the friction of the separated portions may produce suppuration and transform an incomplete into a complete separation.

When an incomplete separation has been diagnosed by the Roentgen Ray, a carefully applied plaster-of-paris cast, well padded with cotton, should be adjusted, enclosing the entire leg as well as the pelvis. The patient must stay in bed with this plaster cast six to eight weeks.

In cases of complete separation, I would not be inclined to conservative inoperative treatment on account of the great difficulty of keeping the trochanter in place, but would advise immediate operation and suturing of the great trochanter to its place. In case inflammation and suppuration sets in, the trochanter should be immediately removed and the parts incised freely for the purpose of establishing free drainage.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, February 14, 1906.

The President, DR. GEORGE WOOLSEY, in the Chair.

PYLORIC OBSTRUCTION.

DR. WILLY MEYER presented a man, 33 years old, who had been operated on in Berlin, in 1902, for benign stricture of the pylorus, the operation done being a gastroenterostomy, combined with an enteroenterostomy.

When the patient was admitted to the German Hospital, in October, 1905, he complained of symptoms which indicated that the pyloric obstruction had recurred. They were not urgent, however, and before reopening the abdomen it was decided to write to Berlin and learn exactly what had been done at the previous operation. While awaiting an answer, the patient's symptoms became more acute; he vomited more or less continuously, especially after taking food, and upon examination it was found that the vomitus contained material that had been acted upon in the jejunum. Lavage of the stomach was immediately begun, and in the meanwhile a letter was received from Berlin which contained the information that on November 24, 1902, the patient's abdomen had been opened for the relief of a benign obstruction of the pylorus, and that at the time of the operation, which consisted of a combined anterior gastro- and enterostomy, gastric ulcerations were found which had extended into the head of the pancreas. A very long, irregularly-curved scar indicated the site of the previous operation.

On examination by Dr. Meyer a distinct splashing sound was made out, evidently within the stomach, and a second similar sound in the left inguinal region, and percussion produced a vermicular contraction of the intestine within. Upon exposing the stomach, by a straight abdominal incision, many adhesions were found as the result of the previous operation. After separating the omentum, it was observed that the efferent portion of the gut was tightly adherent to the abdominal parietes, and within its lumen a small foreign body could be felt. This subsequently proved to be a buried wire suture, the curved end of which was imbedded in the intestinal wall, which it had almost perforated. Upon investigation, it was found that the gastroenterostomy opening had contracted, so that it would scarcely admit the tip of the small finger. The enteroenterostomy had been done very close to the gastroenterostomy. The proximal loop, which had to pass across and over omentum and transverse colon, was long and hung loosely downward into the small pelvis. It was very much distended. From the pelvis it rose up perpendicularly to the stomach. This was probably the cause of the regurgitation of food from the jejunum into the stomach, as it followed the course of least resistance, the enteroenterostomy being placed so close to the stomach, that it could be but of little use.

After proper separation the gut was cut loose from the stomach, the hole in the latter closed by a double row of silk-sutures and that in the gut transversely, to avoid stricture. Before suturing the gut, the foreign body was extracted. Then a posterior gastroenterostomy of good length was done by the elastic ligature method, and the patient made a good recovery. He was entirely relieved of his symptoms, and had gained over thirty pounds in weight since the operation.

SPLENECTOMY FOR SARCOMA.

DR. WILLY MEYER presented a man of 30 who was referred to the surgical division of the German Hospital on account of the presence of a tumor of the spleen, which had grown rather rapidly, and showed signs of malignancy. It was easily palpable, and presented a nodular surface. There were no evidences of free fluid in the abdominal cavity, and yet the comparative

cachexia of the man made it probable that the growth was malignant in character.

Operation, December 18, 1905. After extirpating the umbilicus, the abdominal wall was freely incised, and a large quantity of serosanguinous fluid oozed out. Upon pushing aside the omentum, the spleen came into view. It was plainly the seat of a malignant growth, apparently secondary to embolic infection, although no other organ appeared to be involved. Upon attempting to remove the organ, dense adhesions to the omentum and diaphragm were met with, and in order to gain freer access to the vault of the latter, it was decided to make an osteoplastic flap of the costal arch. This was done by extending the incision upward, stripping off the thoracic muscles, then dividing the costal cartilages next to the sternum and ribs and turning up the flap. The field of operation was now in plain view, so that the adhesions in the vault of the diaphragm could be divided between two ligatures without any difficulty. After this it was found that the splenic tumor was adherent to the pancreas, and it was necessary to surround it with a ligature between the middle and proximal thirds, and remove a large section of it together with the spleen. The retro-peritoneal glands were also much infiltrated, and had to be removed.

After extirpation of the growth, the large cavity that remained was filled with sterile gauze. Miculicz tampon. The man made a good recovery, and had enjoyed fair health since, although there were already evidences of further metastases in the abdomen. The growth proved to be a round-celled sarcoma. The infection had apparently been carried to the spleen from the retroperitoneal glands by way of the splenic artery, which later had become obliterated.

METHODS OF RADICAL CURE OF UMBILICAL AND VENTRAL HERNIÆ.

DR. GEORGE STEWART read a paper with the above title.

DR. JOSEPH A. BLAKE said he had operated on a number of cases of umbilical hernia, and five years ago at the Academy he had read a paper in favor of the overlapping method from side

to side. He would divide umbilical herniæ into two classes,—namely, those with diastasis of the recti muscles, and those in which this separation was absent. In the cases with diastasis in whom the abdominal parietes were much relaxed, he still favored the side-to-side overlapping method. He had operated on twenty-one cases by that method, eighteen for umbilical and postoperative ventral hernia with one small recurrence in a case of ventral hernia, and three for diastasis alone. In other cases, in which there was little or no diastasis of the recti muscles, he considered the overlapping method from above downward as preferable to the side-to-side plan, for the reason that it could be done more quickly and with less shock. This operation required a smaller incision than the other, and recovery from it was usually prompt. Furthermore, if it became necessary to sit the patients up in bed to relieve the breathing, the tension on the wound would also be relieved by the flexion of the body. In cases where the diastasis of the muscles was not pronounced, side-to-side overlapping would encroach on the intra-abdominal space too much, and interfere with breathing.

In his method of operating on these cases, Dr. Blake said, he simply overlapped the entire thickness of the abdominal wall (excepting the skin and subcutaneous fat) without any attempt to suture it layer by layer. One objection to the plastic operation was that the tissues were deprived of their nutrition, and one might as well use foreign material as autoplasmic material that had been cut off from its nutrition. In the vertical overlapping operation the patients usually made a very smooth recovery. The transverse incision was carried to just inside the sheaths of the recti, then the recti were pulled aside a little, and the entire thickness of the abdominal wall was overlapped and sutured. No attempt was made to suture the peritoneum separately.

DR. WILLY MEYER said he had operated on these cases by both the vertical and transverse methods, and had also frequently resorted to heteroplasty, using the silver-wire filigree. He recalled one case in which he had employed the side-to-side overlapping method, which had impressed him with the fact that great care should be exercised in loosening the recti from their sheaths. The case was that of a very heavy woman, with a large ventral

hernia, and on attempting to bring the recti together, it was necessary to loosen them from their sheaths. A perfect cure resulted, but a year later the woman returned with a rather annoying hernia at the outer border of one rectal sheath, where the muscle had been loosened. There was no tissue with which this gap could be filled, and silver-wire netting was thereupon inserted, which resulted in a complete cure.

The speaker said that while the overlapping method of treating this condition was an excellent one, there were a certain number of cases, especially of recurrent abdominal herniæ, where it was not practicable on account of lack of material, and in such cases the use of silver wire or of wire filigree was necessary. A review of his records showed that he had done this kind of heteroplasty fifteen times on fourteen cases with 3 failures and twelve complete cures. The case where a second operation became necessary was that of a woman weighing 250 pounds, who had a very large ventral hernia, which was successfully closed with silver-wire filigree. Subsequently, she sustained an injury, and partial recurrence, and upon reopening the abdomen it was found that the intestines had escaped through a perforation in the wire netting. More of the silver wire was inserted, and there had been no further recurrence since the operation, which was done five years ago. The speaker said he had seen tremendous herniæ which there would have been no chance of curing without resorting to heteroplasty. He emphasized the fact that every kind of ventral hernia could be cured, either by the autoplasmic methods, which were the best if they were feasible; if not, one should not hesitate to use the silver-wire filigree. A number of his cases in which he had employed the latter method remained absolutely cured after three years. Of course undisturbed, aseptic wound-healing was an absolute requirement of success.

DR. STEWART, in closing, said that while the statement made by Dr. Blake that the tendons, deprived of their nutrition, were apparently foreign bodies, practically that did not seem to be the case. He had no explanation to offer as to what became of them, unless it was that they still retained their vascularity. Personally, Dr. Stewart said, he had had no experience with heteroplasty. While he believed there were cases in which it had to be resorted

to, he thought they were very few. It was in the very large herniæ especially that the abdominal wall was lengthened, and that overlapping was possible. The insertion of silver-wire filigree into the abdomen had in some instances given rise to trouble.

Dr. Stewart said he could not speak regarding the permanency of the cure in his cases, as they were all still comparatively recent.

CONGENITAL STENOSIS OF THE PYLORUS.

DR. JOHN ROGERS showed a specimen removed from the body of a child born on November 13, 1905. There were no symptoms for several weeks after birth; then the usual signs of congenital pyloric stenosis developed, and an operation for its relief was done on January 27, 1906. The stomach had a capacity of about three ounces, and the pylorus was represented by a dense fibrous ring of pale color and feeling like cartilage and about the size of the end of the little finger, and was apparently completely closed. A posterior gastroenterostomy by the suture method was done, close to the duodenojejunal fold.

For the first week after the operation, the convalescence was apparently favorable. Then there was a rise of temperature, and upon inspection, a knuckle of intestine was found protruding from the abdominal wound. This was replaced, and the wound again sutured. Union again failed to occur and the child died a week later. At autopsy there was found a low grade of adhesive peritonitis binding together the coils of intestine around and to the margins of the wound (the silk stitches had "cut through"). There was no pus. The rest of the abdominal cavity was normal. The gastroenterostomy wound had united perfectly and the fistula would admit a No. 20 F. sound with ease. The stomach had contracted to a capacity of about half an ounce. The pylorus was about double the size which had been noted two weeks before at operation and was softer. The lumen was found to be patent and capable of admitting about a No. 15 F. sound. On cross section the pyloric wall was about $\frac{3}{8}$ of an inch thick and this apparently consisted chiefly of cedematous muscle. The microscopic examination will be completed later and announced at another meeting. The remarkable fact about the specimen is

that the pylorus was closed at the time of operation and yet became patent within the next two weeks.

DR BLAKE referred to a case of what appeared to be spasmodic stricture of the pylorus in a child five years old, in which the symptoms dated back three years. At times, no food would seem to be able to pass through the pylorus; at other times the child was comparatively free from trouble. A Finney operation was done, which relieved the symptoms. The pylorus was apparently hypertrophied.

MECKEL'S DIVERTICULUM FILLED WITH SEEDS.

DR. GEORGE WOOLSEY showed a specimen, removed from a woman in the course of an operation for extirpation of the uterus and adnexa for malignant adenoma.

While inserting a pad into the abdomen, he came into contact with a pear-shaped body, about two and a-half inches long, which seemed to be filled with solid contents. To the touch, it resembled the gizzard of a chicken filled with small pebbles. It was located about eighteen inches from the cæcum, and proved to be a Meckel's diverticulum. It contained several hundreds of dark-colored small, round and oval bodies, most of which gave a facettied appearance. These were at first sight regarded as tiny gall-stones, so they were sent to the pathologists, who reported that some of them were grape-seeds, but that most of them were tomato-seeds with a number of raspberry and other seeds. The sac contained no fecal matter; nothing but these seeds.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated meeting held February 5, 1906.

The President, JOHN B. ROBERTS, M.D., in the chair.

MODIFIED MÜLLER OPERATION FOR FLAT FOOT.

DR. H. AUGUSTUS WILSON presented a man upon whom he and Dr. R. V. Patterson had performed the combined operation of arthrodesis of the astragalo-scaphoid joint and transplantation of the tendon of the extensor proprius hallucis for the relief of flat foot, a modification of the operation originally described by Dr. Ernest Müller,¹

Müller's operation consisted in using the tendon of the anterior tibial muscle, which he detaches from its insertion and passes through a hole drilled vertically through the scaphoid and attaches the tendon to the inferior-internal surface of the scaphoid, and divides the tendo achillis.

The operation as performed upon the patient shown was done in November, 1904, at the Philadelphia Hospital. The technique has been fully described.² Instead of using the anterior tibial tendon as Müller did, the tendon of the extensor proprius hallucis was taken. The hole through the scaphoid was made as by Müller. In addition to the tendon transplantation an arthrodesis was performed on the astragalo-scaphoid articulation.

Plaster-of-Paris fixation in the extreme over corrected position was maintained for four weeks. Carefully applied physical

¹ Centralblatt f. Chirurgie, Jan. 10, 1903, p. 40.

² American Medicine, May 6, 1905, p. 725.

culture soon brought the muscles into function in their new relations, and enabled the patient to control the action of his feet involuntarily. The loss of the extensor proprius hallucis in its former and normal position was very apparent at first, as the patient had toe drop. This was gradually overcome as the extensor brevis digitorum became developed in the assumption of its newly-acquired function.

The best evidence of the full success of the operation on the patient is the fact that during the year since the operation he has been engaged in hard work without inconvenience. He had been enabled to work full time without pain, which was impossible before the operation was done. As a preliminary to operative correction it is essential that the feet should be freed from all restraint of full free motion, as it is apparent that the presence of any restraint will interfere with muscular development. The necessary amount of free motion can be secured by the employment of the mechanical arch-producer devised by Dr. Wilson.

DR. JAMES K. YOUNG said he had for several years employed in the treatment of flat foot the mechanical arch-producer devised by Dr. Wilson and found that it gave very good results. He generally applies the instrument after baking the foot for some time. This makes the parts more pliable and a greater degree of correction may be obtained at each sitting.

ABSCCESS OF THE ABDOMINAL WALL COMMUNICATING WITH THE BLADDER WHICH CONTAINED A CALCULUS.

DR. JOSEPH M. SPELLISSY related the history of a boy, eighteen years of age, who was admitted to the Methodist Episcopal Hospital on February 12, 1901. He had enjoyed perfect health till his sixteenth year. He then began to suffer with pain during urination and also and more particularly at the end of the act, when he passed pus. Occasional distress from retention of urine was relieved by catheterization. His condition sometimes kept him in bed and once he suffered for a week with œdema of the foot. During the three months prior to admission his abdomen had become swollen in the median line and he passed a small urinary calculus per meatum.

On admission, a reddened, elevated, tense inflammatory mass,

shaped like an enlarged uterus, occupied the middle of the abdominal wall from just below the umbilicus to just above the pubes, and seemed on the point of rupture. (Fig 1.)

Under ether anæsthesia, the passage of a sound confirmed the suspicion of the presence of a vesical calculus; two incisions, one in the lower and one in the upper part of the abdominal mass, liberated a free amount of pus from apparently independent cavities in the abdominal wall. But a third incision, joining the other two, not only discovered a sinus uniting them but also a fistulous passage communicating with an indurated, thickened, suppurating bladder contracted on a roughened calculus, (Fig. 2) measuring $2\frac{1}{4} \times 1 \times \frac{3}{4}$ inches. The spontaneous effort of this calculus to deliver itself through a suprapubic abscess of the abdominal wall was assisted by incision, through which the calculus was removed. A catheter was inserted into the bladder per urethram, and both bladder and abscess walls were scrubbed with gauze and irrigated. Convalescence with suprapubic and urethral drainage terminated in an uneventful recovery with all sinuses closed in three months.

INFLAMMATORY MASS IN THE RIGHT ILIAC FOSSA CONTAINING AN ENTEROLITH THE NUCLEUS OF WHICH WAS A PIN, AND LATER DISCOVERED TO COMMUNICATE WITH THE APPENDIX.

DR. SPELLISSY also related the history of a man forty years of age who was admitted to St. Joseph's Hospital, complaining of a dense mass immediately internal to and apparently continuous with the anterior border of the right iliac bone, and extending from its anterior superior spine down to its junction with the pubis. He associated the origin and duration of this mass with an irreducible inguinal hernia existent for fifteen years.

Under ether anæsthesia, with the assistance of Dr. G. G. Davis, on April 11, 1903, an incision close to the margin of the right iliac bone, close to and below its anterior superior spine, passed through a most dense, apparently fibrous mass about three-quarters of an inch thick. Through this capsule an extraperitoneal space below the ileopectineal line was reached by blunt dissection and a hard fusiform body found within it. On extraction the body proved to be an enterolith, which on incision was

found to contain a pin as its nucleus. (Fig. 3.) Nothing else was found in the cavity, which seemed to be a blind pocket, but it diffused a fecal odor. It was, therefore, drained and but partially closed. Within a week after the incision, a fecal fistula developed in the wound and persisted till the patient, without warning, disappeared from the hospital; and was still present when he was readmitted, five months later, during the service of Dr. G. G. Davis.

Operation under ether anæsthesia by Dr. G. G. Davis, on September 23, 1903, found the fistula to communicate with the appendix. Both fistulous tract and appendix were excised, and the patient was discharged cured three months later.

AN INGUINAL ABSCESS SIMULATING HERNIA.

DR. SPELLISSY presented a man, twenty-three years of age, an inmate of the Pennsylvania Training School for Feeble-Minded Children at Elwyn, who began three years ago to have in the right groin a small walnut-sized reducible mass, supposed to be an inguinal hernia. The subsequent growth of this mass was concealed by the patient until it was brought to the attention of the resident physician on November 25, 1905, when the condition illustrated in Fig. 4 was discovered and operation for strangulated inguinal hernia requested.

Examination showed an irreducible, untympanitic, painless mass (Fig. 4.) with inflammatory pointing at a nodular apex coincident with an abdominal mass in the right iliac fossa, and a practically normal degree of temperature and rate of pulse and respiration. The patient's spine was undeformed, painless, and flexible. Diagnosis of iliac abscess gravitating to the thigh was made and interference postponed to the following day, that a long director for a counter opening might be obtained.

Under ether anæsthesia the inguinal abscess was incised, curetted, and drained with an evacuation of three to four pints of pus. The crural canal, however, was found impassable and there was no communication with the abdomen; the abdominal mass persisted and pressure upon it elicited no change in its bulk and brought no new pus into the inguinal wound. Exploratory incision for the removal of this mass is reserved for another occasion, and the diagnosis is now revised to inguinal abscess coincident with an independent abdominal mass.

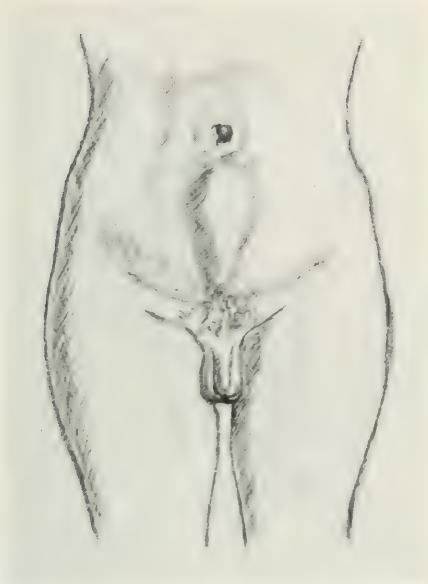


FIG. 1.—Abscess of the abdominal wall communicating with the bladder containing a calculus.

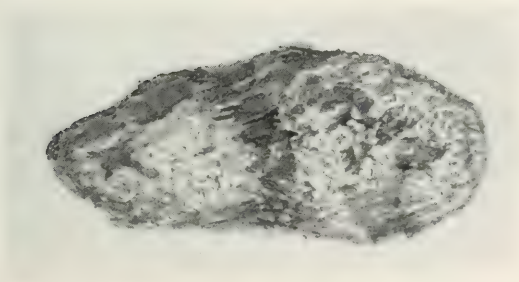


FIG. 2.—The calculus of Case I, actual size.

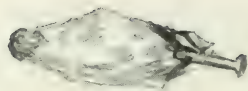


FIG. 3.—Actual size of enterolith encrusted upon a pin; when first removed the enterolith completely enveloped the pin.



FIG. 4.—Inguinal abscess simulating hernia.

PERI-ŒSOPHAGEAL ABSCESS CONTAINING A SWALLOWED FOREIGN BODY.

DR. SPELLISSY related the following case: A freight conductor aged forty-four years was admitted to St. Joseph's Hospital with a large mass occupying the left side and median line of the neck, the thyroid cartilage being pushed to the right side. The mass did not fluctuate, the tongue was furred, and the pharynx was inflamed but neither it or the larynx, according to the report of Dr. G. Marshall, exhibited any marked abnormality.

The patient attributed his condition to the forcible swallowing of a piece of bacon, caused by a violent jolt while breakfasting, seven days before, in the caboose of a freight train that had stopped so suddenly as to throw the patient forward three feet. Efforts by the finger to recover the bacon were unsuccessful. Faucial distress was immediate, and reached such a degree by afternoon, that the patient went home to bed and remained there until his admission to hospital. During the interval he was subject to chills, fever, occasional delirium, and the gradual growth of the mass. The presence of any abnormality of the neck prior to the accident was denied.

An exploratory incision of three inches along the anterior border of the sternocleidomastoid, under ether anæsthesia and with the patient in the Trendelenburg position, discovered a prominent thyroid. Hypodermic exploration of this gland being negative, its outer border was freed, the gland retracted inward and the dissection carried down to the vertebræ beside the œsophagus. Escape of foul pus into the pharynx and the wound was coincident with the disappearance of the mass and the discovery in the abscess cavity of a piece of bone, first thought to be the patient's hyoid but later found to be removable, to be foreign, and to measure $1\frac{1}{3} \times \frac{1}{2} \times \frac{1}{16}$ inches. Partial closure of the wound with drainage was followed by recovery without a fistula in forty-six days. Return of the patient for œsophageal bougieing was advised.

DR. JOHN H. GIBSON was reminded by Dr. Spellissy's third case of a patient seen at the dispensary of the Jefferson Hospital while he was chief of clinic. The man brought an indignant note from his physician who said he sent the patient to a truss-maker and the latter had returned him with the statement that he had

no hernia. Examination showed an iliac abscess which had come down on the sheath of the iliac muscle beneath Poupart's ligament. The mass disappeared when the man lay down, there was impulse on coughing and hence the swelling showed some of the signs of a femoral hernia. It was external to the vessels, however, and easily shown to be an abscess. There was no rigidity of the spine, as the abscess was iliac instead of psoas in type. The man was operated on and made a good recovery.

VICIOUS CIRCLE AFTER GASTRO-ENTEROSTOMY.

DR. JOHN H. JOPSON reported the history of the following case: An adult woman had suffered for more than a year with symptoms of chronic gastric ulcer, including prolonged and obstinate vomiting, sometimes containing fresh, sometimes altered blood, without any excessive hemorrhages at any one time, and an inability to retain anything but liquid diet. In the feces the occult-blood test was positive. Then solid food was attempted. The disease had resisted prolonged and careful medical treatment including confinement to bed for about nine months out of twelve. At the time of operation she was a chronic invalid, rather neurasthenic, thin, and somewhat anæmic.

Operation, November 15, 1905, Dr. Willard assisting. The stomach was dilated and somewhat lower than normal. Rapid scrutiny showed no external evidence of ulcer or cicatrix. A posterior gastroenterostomy was performed by the aid of the Moynihan clamps. The opening in the bowel was made 4 or 5 inches below the duodeno-jejunal angle, and in the stomach at the most dependent point of the greater curvature. At its conclusion the edges of the opening in the transverse mesocolon were sutured to the jejunum beyond the anastomosis by three stitches, one median, and one to either side. After the left-hand stitch was placed it was casually noted that there was slight puckering of the bowel at this point. The operation was otherwise completed in the usual manner.

Following the operation the patient vomited occasionally for two days, after which nausea and vomiting became less frequent, and finally practically ceased. Six days after the operation (November 21) the vicious circle was rather suddenly established, and the patient began to bring up large quantities of dark green

bilious material. The vomiting resisted all the usual treatment and persisted during the following day. On the 23d it became frequent, and the patient's general condition, heretofore good, at the end of the day became suddenly much worse. There was a rapid rise of pulse rate in a few hours from 100 to 140, and it was evident that unless prompt relief was afforded the patient would succumb. She was re-operated at midnight, November 23. The abdomen was reopened through the primary incision, the abdominal cavity found clean, and sharp angulation of the gut at the site of the gastroenterostomy was found as the cause of the symptoms. There were slight fresh adhesions between the adjacent surfaces of the two limbs of the spur. There was firm union of the opening in the mesocolon to the bowel, the edges of the opening thickened and apparently contracting around it, causing acute and absolute obstruction of the flow from the proximal to the distal limb. The adhesions were separated, the bowel straightened itself out, and the proximal loop emptied itself.

There seemed to be an improvement in the general condition of the patient dating from this time, which permitted the operation, heretofore a hurried and anxious one, to be finished more deliberately. The choice of treatment lay between freeing the mesocolon from the bowel and re-suturing it to the posterior wall of the stomach, and an anastomosis between the two limbs of the potential spur. The latter method was decided upon, and a medium-sized Murphy button was introduced as far away from the anastomosis as the short proximal limb permitted. The button was reinforced anteriorly by a Cushing suture. After operation the improvement in the general condition was prompt and gratifying. Vomiting was not checked at once but was less in amount. Retching was for a time a frequent and distressing symptom. One week after the second operation she was retaining her nourishment fairly well, nourishment being still liquid, and only vomiting occasionally. Two weeks after operation vomiting had practically ceased. The button was passed on the nineteenth day. Since convalescence has been established she has gained rapidly in weight, is free from gastric symptoms, and enjoys a liberal diet.

Moynihan emphasizes as one of the eight important points in his method of gastroenterostomy the suturing of the transverse

mesocolon to the jejunum. His remarkable record of successes and the freedom of his patients from regurgitant vomiting after operation would seem to be good proof that there is no flaw in his technique in this direction, and I can only attribute the result in this case to the fact that one or both of the lateral stitches were probably placed too far from the anastomosis. If this were the case then any separation of mesocolon from the thin wall of stomach would tend to drag together the proximal and distal portions of the jejunum, as would also any contracture of the opening in the mesocolon. Moynihan says the stitches should be placed just outside the line of anastomosis. The accident which occurred in this case serves to emphasize the necessity of care in the least and most minute details; at the same time it may be questioned whether, theoretically, at least, the same contracture might not occur at a later period, no matter what precaution in this respect was observed and Moynihan refers to a case operated by Czerny and reported by Stendel in which obstruction of the efferent loop had been so caused. If as there seems to be in these cases, and as Deaver emphasizes there is a tendency for the opening in the mesocolon to contract and become tough and cicatricial, it may in time cause an obstruction to the intestinal flow at the anastomotic site. Deaver, in speaking of the measures necessary to prevent hernia of the gut through the mesocolon says: "To obviate the occurrence of this complication most surgeons have adopted the precaution of stitching the edges of the opening in the mesocolon to the stomach. Mr. Moynihan, on the contrary, advises stitching it to the jejunal loop below the anastomosis. I cannot approve of this modification of the usual technique. Mr. Moynihan does not give any reason for this preference, and to my mind no good reasons exist. By suturing the mesocolon edges to the stomach we in the first place close the opening into the lesser peritoneal cavity; this is the most important function of the procedure. But in addition to this we are sure the gastric opening being the lowest portion of the stomach, as the mesocolon draws the stomach down into a funnel-shaped depression, and we moreover avoid any possible constriction of either loop of the jejunum. That this last is an important feature of the operation, I think, cannot be denied. Probably every surgeon has seen cases where the opening in the transverse mesocolon, not

having been sutured to the stomach, contracted, and, becoming quite tough and cicatricial, presented a very material obstruction to the emptying of the proximal loop of the jejunum into the distal loop. But, although I know this cannot be blamed for all cases of vicious circle, it is certainly my conviction that obstruction of the afferent loop is the most usual cause of pernicious vomiting." Deaver makes no criticism of the practice of the Mayos of stitching the mesocolon to the site of the anastomosis itself.

This case also illustrates the well-recognized necessity of prompt operation in the more acute cases of vicious circle. The symptoms may be as acute as those due to the commoner obstructions of the bowel, which are so rapidly fatal unless promptly operated.

PERFORATED GASTRIC ULCER; SUTURE AND RECOVERY.

DR. JOHN H. JOPSON related the history of a man, 50 years of age, who for five years had suffered from stomach trouble, his symptoms consisting of pain in the epigastrium, coming on after eating, and occasionally associated with vomiting. Vomiting had ceased after a few months, but pain had continued up to the present time, and for eight weeks before admission had been much more severe. He had vomited once, two weeks before admission. On September 9, the day before he entered the hospital, pain in the epigastrium grew rapidly worse and soon spread to the right iliac region. Twelve hours later it involved the entire abdomen, being most severe in the right iliac fossa.

He was admitted on the evening of September 10, 1905, suffering acutely and complaining of pain in the right iliac fossa. Temperature $100\frac{3}{5}^{\circ}$, pulse 120, respiration 28. The abdomen was slightly distended, and rigidity was generalized but most marked on the right side. Tenderness was extreme in the right iliac region, slight elsewhere. The expression was good. He was admitted for operation with a diagnosis of appendicitis, and the history of long-standing gastric trouble was not elicited before operation. The duration of the acute symptoms and the physical examination indicated a spreading peritoneal inflammation, apparently originating, still more pronounced, in the appendiceal region, and it was with this diagnosis that he was transferred to the operating-room one hour after admission.

An incision at the outer border of the right rectus muscle disclosed free turbid fluid in the abdomen and pelvis. The cæcum and appendix were congested, the base of the appendix surrounded by a curtain of peritoneum, as though it had found lodgment in one of the retro-cæcal pouches and later herniated through its wall. The appendix was liberated, and removed. It partook of the diffused peritoneal inflammation but was not the cause of it. The ileum was examined and found to exhibit signs of beginning general peritoneal inflammation only. Fresh adhesions were discovered above the wound in the direction of the gall-bladder and pylorus. The wound was enlarged upward, almost to the costal margin, and a perforation, one-eighth of an inch in diameter, was found on the upper border of the pylorus, actively leaking, and was turned in by a layer of interrupted and one of continuous Lembert sutures. The infection had travelled downward to the pelvis along the right side of the abdomen, as indicated by numerous fresh adhesions and lymph-patches in this region. After free flushing with saline solution, the abdomen was drained from diaphragm to pelvis by iodoform and plain packing above and to the inner side, holding back the small intestines, a strip into the kidney pouch, and tubular and gauze drainage in the pelvis. A few silkworm-gut sutures were placed over the packing to hold it in place, but the wound was not closed. The patient stood the operation remarkably well and suffered but little shock at any stage, in spite of free manipulation of the abdominal contents and widespread infection.

After operation he was placed in the Fowler position and given frequent saline enemata, and convalescence was uneventful except for some vomiting on the second day after operation. The bowels were moved spontaneously on the third day and he was fed by the rectum for five days. The large wound healed slowly and he was in bed for nearly two months, and in the hospital for three.

The patient was brought in as a case of appendicitis; the gravity of his condition was recognized by the resident physician, and preparations for operation were begun at once.

Had a more complete history been elicited before operation a diagnosis of ruptured gastric ulcer should have been arrived at. As it was, the physical signs pointed strongly to an infection,

reaching its greatest intensity in the appendicial region, symptoms which accorded well with the history of an illness dating back only a day or two, which the patient gave when first seen. There were no disadvantages attending the primary low incision; indeed it was proved to be advantageous, as when extended it gave the best possible drainage along the entire route from pylorus to pelvis, which the infection had already travelled, and the drainage was much more effective than could have been obtained by primary incision in the epigastrium and secondary suprapubic drainage, as is usually advised. The freedom from shock during and after operation was very striking in a case with such an extensive peritoneal involvement.

GASTROPTOSIS AND DILATATION.

DR. EDWARD B. HODGE reported the case of a woman 33 years of age who was admitted to the Presbyterian Hospital, July 31, 1905. For the preceding three months she had been under treatment in the dispensary of the hospital, but without benefit.

Since the birth of a child, in 1892, she had suffered from sour eructations, vomiting, burning pain in stomach, flatulence, marked constipation, with headache and extreme nervousness. From her usual weight of 140 pounds she had fallen to 114 pounds.

On inflation of the stomach, its lower border was found to be two and one-half inches below the umbilicus.

After some weeks' observation in the hospital, during which her weight had fallen still further, to 95 pounds, and she had become anxious for some operation for her relief, it was decided to elevate the stomach by shortening the gastrohepatic ligament.

On October 13, with Dr. Willard's assistance, Dr. Hodge opened the abdomen in the middle line below the ensiform. The lesser curvature was about half way to the umbilicus, and the greater curvature $\frac{3}{4}$ inch below the umbilicus. There was no evidence of ulcer, recent or old; the pylorus was opened and the gall-bladder found to be normal. Three transverse rows of interrupted silk-sutures were put in the gastrohepatic ligament, bringing the stomach well up under the liver. As the stomach was dilated, at Dr. Willard's suggestion, about 2 inches of the anterior gastric surface was folded in with a continuous transverse silk

suture, midway between the curvatures. The abdomen was closed in layers. Convalescence was easy, and before patient left the hospital, on November 28, she was eating a generous mixed diet. She is now perfectly comfortable, does all her housework except washing, and weighs 125 lbs., a gain of 30 lbs. The bowels move daily without a laxative. Stomach tympany extends from just below the ensiform to $\frac{1}{2}$ inch above the umbilicus.

DR. H. D. BEYEA said he had performed this operation upon eight patients. All except one improved very remarkably. The exception was an extremely neurasthenic girl, who improved during a period of six months and then was obliged to nurse two sisters during attacks of typhoid fever; she is now no better than she was at first. All the other patients gained weight and all were relieved of the gastric symptoms.

URETERAL CALCULUS.

DR. JOHN B. DEEVER read a paper with this title (for which see page 733).

TRANSPERITONEAL EXAMINATION OF THE URETER IN CASES OF SUSPECTED URETERAL CALCULUS.

DR. JOHN H. GIBBON read a paper with this title (for which see page 743).

DR. WILLIAM L. RODMAN, speaking to the questions propounded by Dr. Deaver, said that the Röntgen rays are not always satisfactory in the diagnosis of calculi in the kidney and ureter, many mistakes being made thereby. This is especially true when the supposed lesion is low down and well toward the median line of the pelvis. In this location little bodies described as centres of calcification in cartilages have by different observers been mistaken for calculi. With Dr. Pfahler the speaker had had at least three such cases. In the first case, a woman, the skiagram showed what seemed to be certainly two stones in the ureter low down near the bladder. His suspicions were aroused, the ureter was catheterized and the hard bodies felt and demonstrated to be disconnected with the ureter. Very recently a similar condition was shown by a skiagram in a young man without renal or vesical symptoms. It was plainly such a case as Bevan and others have demonstrated to be points of ossification or calcification of the

ligaments. Bevan, of Chicago, has seen many such cases. As to opening the ureter by the transperitoneal or extraperitoneal route he believes there is no doubt of the almost unanimous opinion that the extraperitoneal is the safer. In fact, it may be said in view of all that has been learned upon the subject that the intraabdominal method is at the present scarcely warranted. The operation can be done by this method but the surgeon who so does is courting disaster. In cases of encysted stone near the bladder the site can usually be reached through the bladder by means of a suprapubic cystotomy. He was interested in Dr. Gibbon's reported combining of extra- and intraperitoneal methods in removing a calculus. Dr. Gibbon is correct in saying there is danger of soiling the peritoneum; he would prefer the extraperitoneal route always, but when working in the abdomen as was Dr. Gibbon the method employed by him may very well be used.

DR. GEORGE G. ROSS spoke of a case of ureteral calculus in which operation was not performed. The patient had repeated attacks of renal colic and after each passed bloody urine. The X-ray showed a dense shadow near the neck of the bladder. The man was a travelling salesman and declined operation, taking morphine to relieve the attacks. One morning he reported jubilantly that he would have no more attacks as the night before he had passed an enormous amount of urine during sleep and a day or two later the calculus was passed by the urethra. There evidently had been obstruction of the ureter and hydronephrosis, which was relieved by the passage of the stone.

DR. JOHN B. ROBERTS said that ten years ago he reported the transperitoneal removal of a ureteral calculus. He found no difficulty in keeping the peritoneum perfectly clean and both the ureteral and abdominal wounds healed by first intention.

DR. GIBBON, in closing, corroborated Dr. Rodman's statements regarding transperitoneal operation upon the ureter; it is seldom justifiable. In the cases reported, however, the removal of the calculus was not transperitoneal, the ureteral operation itself being entirely outside of the peritoneum. Under such circumstances if the surgeon so desires he can close the peritoneum before taking the stone out of the ureter, but the manipulation made possible by the peritoneal opening enables one more easily to remove the calculus. Without such opening it is utterly impos-

sible to get at the ureter throughout its entire length unless the kidney be delivered and access gained in that manner. In both the cases reported the microscopic findings of blood in the urine were of great diagnostic value. If a stone is found in the ureter when operating for appendicitis, it should be removed. In such an instance, as before stated, the surgeon can choose the route by which he will remove the calculus.

RENAL CALCULUS WITH MAGGOTS WITHIN THE STONE.

DR. JOHN H. GIBBON reported the case of an Italian laborer, 33 years of age, who was admitted to the Pennsylvania Hospital July 21, 1905 and transferred to the surgical wards on July 24. At this time he had all the symptoms of a pyonephrosis on the left side, although he was able to be up and about at times. There was a large quantity of pus in the urine and marked tenderness over the left kidney. Cystoscopic examination was unsatisfactory. He was operated upon and a large soft calculus was found to occupy nearly the whole pelvis of the kidney, which extended up in the calices and was removed in two portions. There was a large quantity of pus in the kidney which had a very foul odor. The wound was drained and partially closed. The stone was examined in the laboratory on the same day of its removal. The larger portion measured $2 \times 2\frac{1}{2}$ cm. in diameter; the small portion measured $1 \times 1\frac{1}{2}$ cm. and the weight of both was 17.5 grams. Passing through the larger portion of the stone were a number of small smooth channels in which were found numbers of minute maggots. Dr. Gibbon saw the specimen the next day when the maggots were still quite active, crawling in and out of the channels in the stone. The maggots were so small that their nature was doubted for a while. A number of them with a portion of the stone was sent to Dr. Charles Wordell Stiles, of Washington, who reported that they were the maggots of the ordinary domestic fly. On the fourth day after the operation the dressings removed from the wound were kept over night wrapped in a sterile piece of gauze surrounded with wax paper, and on the following morning there were a large number of full-grown maggots present. In none of the subsequent dressings were maggots found. The patient made a good recovery from his operation, but as the sinus continued to discharge large

quantities of pus, and as occasionally the drainage would be interfered with, Dr. Gibbon removed the kidney on November 25th. The patient made a satisfactory recovery from the second operation.

In questioning the patient it was learned that in Italy he had some years previous had inflammation of the bladder for which irrigation was done. The first symptoms of his present illness appeared a few months before his admission to the hospital and at this time he irrigated his own bladder. He says that he was always careful in performing this irrigation to have the catheter and solution clean, and he cannot recall ever having seen flies on the catheter. It is probably true, however, that this was the source of the infection.

HYDRONEPHROSIS; DISTENTION OF URINARY BLADDER.

DR. GIBBON also reported *a case of cystic kidney with obliterated ureter associated with a fibroid uterus causing a chronic distention of the bladder with retention of urine.*

This patient was admitted to the Pennsylvania Hospital on November 17, 1905. She was 43 years of age, a widow, and had never had children. She came to the hospital because of a large tumor in the lower portion of the abdomen and marked vesical and rectal tenesmus, the latter symptoms being of but a few weeks' standing. Examination showed a tumor projecting above the pubes which was quite hard and which on bimanual examination seemed to move with the uterus. Two distinct tumors could be felt in the uterus, one in the anterior portion just above the cervix which pressed upon the bladder, and the other could be felt through the rectum which was nearly occluded by it. A diagnosis of fibroid tumors of the uterus was made and a hysterectomy recommended. When the abdomen was opened it was discovered that the tumor felt above the pubes was a greatly distended bladder. One hour previous to the operation the patient had been catheterized and 26 oz. of urine withdrawn; on the table the catheter was again introduced and 20 oz. of urine withdrawn. The bladder did not contract when emptied but collapsed in thick folds, the wall appearing to be about $\frac{1}{2}$ inch thick. The uterus contained a number of fibroids: one on the anterior surface low down pressed against the bladder in such a way as to produce

obstruction just as an hypertrophied prostate does in a man. Examination of the ureters at their point of crossing over the iliac vessels showed no distention of either. An examination of the kidneys showed a normal right kidney but the left was an enormous cyst. A hysterectomy was done and then the left kidney was exposed through a lumbar incision. It was so large that it was impossible to remove it without emptying it, and even after the escape of a large quantity of grayish, odorless fluid the delivery of the kidney was difficult. In ligating the pedicle the ureter could not be made out. This kidney was subsequently examined in the laboratory and no ureter could be found. The kidney substance had been so completely destroyed that none could be found microscopically. The kidney measured 25 cm. in length by 15 cm. in width, and the wall varied from 1 to 4 mm. in thickness. The patient made an uninterrupted convalescence.

UNREDUCED ELBOW DISLOCATION.

DR. WILLIAM J. TAYLOR showed a skiagraph of an unreduced forward dislocation of the elbow taken three weeks after the accident, as well as a skiagraph taken the day following the reduction of the dislocation.

The patient was a young man of 29 who, while playing football, fell upon the ball, and as he fell another player running up behind accidentally kicked him on the lower end of the left humerus just above the elbow; this produced the dislocation without fracture.

Three weeks after the accident he came to Dr. Taylor, who had a skiagraph taken which revealed the true condition of affairs. Owing to some unavoidable delay it was nearly four weeks after the accident before the attempt could be made at reduction. He was given ether and after a great deal of physical effort and limbering up and breaking up the adhesions of the elbow, reduction was accomplished. The second skiagraph showed very well the bones in their proper relation.

AN ETHER INHALER FOR USE IN OPERATIONS REQUIRING THE PRONE POSITION.

DR. THOMAS C. STELLWAGON (by invitation) presented this apparatus. It was devised to obviate the difficulty experienced in administering ether to patients when prone, especially when the

Edebohl technic is employed. In addition, with the ordinary inhaler a very large amount of ether is required. He at first used a rubber bulb to force ether into the old inhaler but this proved unsatisfactory. The present modification has been in use in the Jefferson Hospital during the past six months and has met with general approval. With it considerably less ether is required. The addition consists of a lateral extension, near the lower end of the instrument, which is placed over the mouth of the patient. The hood-shaped mouthpiece is reversible to allow application when the person is on either side. But one hand is required to hold this inhaler to a patient's face. A question regarding the device that is not yet entirely settled is whether the patient gets sufficient air with the ether. Possibly a valve above the mouthpiece is needed to permit the egress of expired air.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, January 5, 1906.

The President, DR. D. A. K. STEELE, in the Chair.

POPLITEAL ANEURISM, RUPTURED BY MANIPULATION.

DR. CHARLES ADAMS reported the case of a man, aged 58 years, who was seen in consultation with Dr. M. C. Bragdon, August 7, 1905.

He has been the subject of indigestion and headaches most of his life and early in July last put himself in the hands of an osteopath for treatment. The lack of judgment displayed by this operator was excelled in degree only by the vigor of his treatment. This worthy's governing idea seems to have been violent over-extension of the extremities, one particular fancy being to extend the lower limbs on the pelvis and then bend the legs over the body toward the patient's shoulders. He expressed himself as particularly pleased when he could "hear 'em crack." For a man of nearly sixty, with atheromatous arteries all over his body, the treatment was, to say the least, strenuous. After two weeks of this manipulation the patient became lame, too lame to get about, so, in spite of the appearance of a swelling behind and below the knee, the treatment was continued at the home of the patient until he could no longer endure the torture and finally sent for his physician, who, recognizing the surgical character of the case, called a consultation.

Dr. Adams found the patient suffering from severe pain in the right leg; the calf was distended to one and two-thirds the

size of its fellow, the skin heightened in color and shiny; the pulse was 110, the temperature 102° F. At this time, pulsation could be felt in the dorsalis pedis. At his next visit, he found entire absence of pulsation below the knee, the foot cold, and there could be no doubt that rupture of the popliteal had produced the condition present. Exploration of the swelling gave vent to a large quantity of fluid blood and clots in various stages of organization which had filled the popliteal space and a cavity beneath the posterior muscles of the leg. Amputation was performed through the middle third of the femur. The blood-vessels were so soft that direct ligature to them was impossible. Hæmostasis was effected by inclusion of neighboring tissues in the ligatures. The wound healed practically by first intention, but for ten days the man was septic probably from autointoxication, as the condition cleared up after repeated catharsis and no other cause could be discovered.

Examination of the amputated limb showed a true aneurism of the popliteal artery, ruptured in its posterior surface, forming a false aneurism which again ruptured and resulted in the condition found at operation.

HYDRONEPHROSIS AND APPENDICITIS.

DR. CHARLES ADAMS described the case of a man, 60 years of age, who in 1876 began to suffer with attacks of dull heavy pain appearing, with gradual onset, at about the junction of the eleventh rib and the right scapular line, extending forward in the direction of the navel and lasting three to four hours at a time. These attacks came on about once in three months during a period of two years. They were somewhat relieved by sweats and hot drinks, and apparently accompanied by no urinary or bowel trouble. There has been no pain in the abdomen since the cessation of the acute attacks, in 1878. A tumor, a long ovoid mass, occupying the right side of the abdomen from the costal margin nearly to Poupart's ligament, was first noticed in 1900 and has undergone a gradual increase in size since that time.

A diagnosis of hydronephrosis was made and confirmed by a cystoscopic examination, made by Dr. W. N. Senn, which showed that no urine entered the bladder through the right ureter.

After due preparation the patient was operated on at the

Evanston Hospital. A vertical incision was made, over the prominent portion of the tumor through the outer border of the right rectus muscle, the two layers of peritoneum identified and cut through.

The tumor was enucleated from its bed without difficulty. The renal artery, comparatively small, and one large vein ($\frac{3}{8}$ inch) were ligated, as was also the ureter; the latter in its free portion, however, was impervious. The tumor, which was about ten inches long by six inches in transverse diameter, consisted of an exceedingly thin-walled cyst containing eleven pints of perfectly clear fluid. The ureter was stretched across the anterior surface of the tumor, adherent and occluded.

The retroperitoneal space was dried out, and there being no hemorrhage the intestines were allowed to fall into place, and search was made for the appendix vermiformis. It was found buried in a mass of adhesions some of which were quite ancient. The appendix itself was exceedingly soft and ruptured during the attempt to separate it from the surrounding adhesions, giving issue to a small mass of inspissated pus. The parts concerned were carefully cleansed and the abdominal wound closed by suture in layers. The condition of the appendix was remarkable in view of the fact that at no time while the patient had been under observation had there been any pain or disturbance of temperature or pulse, nor could he remember having had any pain in the abdomen since the attacks noted above as ceasing in 1878. Recovery smooth and complete.

HYDRONEPHROSIS.

DR. CHARLES ADAMS also reported the case of a woman, 34 years of age, who fourteen years previous to operation had a severe attack of pain in the right loin and groin following a long walk. Other attacks followed, and during the attack a tumor was noticed in the right side of abdomen. Her then physician made a diagnosis of intermittent hydronephrosis from flexion of the ureter due to mobility of the kidney. The kidney was successfully kept in place by bandage for about four years, after which time two severe attacks of pain occurred and the tumor became permanent.

In November, 1897, the tumor was aspirated or tapped and leakage occurring into the peritoneal cavity, Dr. Fenger saw her and opened the abdomen, cleansed its cavity and sutured the dilated kidney to the anterior abdominal wall. The constant discharge from the fistula remaining after the operation was a source of so much annoyance to the patient that Dr. Adams removed the kidney by abdominal incision in February, 1898. No difficulty was met in the operation except in separating some adhesions to the colon. The patient made a smooth recovery. In this case only the upper half of the kidney was involved in the dilatation, the secreting structure of the lower half it would seem had been made inoperative after a certain degree of tension had been reached and resumed its function after the tension had been relieved by the establishment of the fistula.

NEPHROLITHOTOMY—CYSTONEPHROSIS.

DR. CHARLES ADAMS further reported the case of a woman, aged 31, who ten years previous to coming under his care in 1900, just after concluding her course in college, began to suffer from constant lassitude, headaches and extreme constipation, feeling generally "run down." While sea-bathing she was taken with a severe chill, was carried home on a litter and confined to bed for five months with what was called "a low type of peritonitis." After getting up from this attack she was treated for almost every form of abdominal inflammation for a period of eight or nine years, going about the country and suffering many things at the hands of many physicians. During most of this time a painful lump was apparent in the right side of the abdomen, which was generally pronounced to be an enlarged gall bladder. She suffered from constant backache and headache, was in bed with excruciating pain for three days every month, her urine was purulent and foul smelling, occasionally bloody; she slept badly, and was extremely constipated.

Examination of the abdomen showed a freely movable, enlarged and exquisitely tender right kidney; through the rectum could be felt a fixed and slightly anteflexed uterus; the ovaries very tender to touch. The right ovary was enlarged, presumably cystic; the condition of the left was uncertain.

August 30, 1900, the abdomen was opened in the median line between the umbilicus and symphysis by a three-inch incision, the uterus tubes and ovaries were bound together and covered by dense tough adhesions. After much trouble the right ovary was uncovered and found to be cystic throughout and was therefore removed. The left ovary was much smaller than normal and exceedingly hard. On account of the ten years' history of continual pain and the beforehand expressed wish of the patient, it was also removed. (During the subsequent course of the case none of the symptoms present seemed to be due to the laparotomy.) After closing the abdominal wound the patient was placed on the left side and the right kidney exposed by Simon's incision at the edge of the erector spinæ. The organ was somewhat thinned out by distention and a calculus was plainly palpable through its substance. The kidney was incised through its convexity and the calculus extracted entire. The ureter was catheterized to prove its patency and the kidney fastened to the muscular structures by stitches of catgut passed through its capsule. Tubular drainage was employed, the tube being passed into the pelvis of the kidney and secured by a suture to the wound margin.

Before the operation the patient's temperature was rarely below 99° F. and generally about 100° F. The pulse ranged from 72 to 90, varying with the amount of pain experienced. In the night following operation the temperature rose to 102.8 and the pulse to 160, and from this time on the pulse was much higher proportionately than the temperature, probably due to the effect of operation shock on the cardiac muscle. The patient was intensely hyperæsthetic, the stomach exceedingly irritable, the most careful and gentle dressings of the lumbar wound frequently would produce attacks of nausea and vomiting lasting for hours. During the ten days following the operation the patient's temperature gradually decreased to about 99° F. The pulse remained weak and from 20 to 30 beats higher than what would correspond to the temperature. Feeding, salt solution enemata, and cardiac stimulation were thoroughly kept up during this period.

On the twentieth day after operation the patient had severe pain in the operated kidney, the urine from the bladder, which had been purulent, suddenly became clear, while through the small

opening left in the lumbar wound there was only slight discharge. A large sterilized catheter was introduced into the renal pelvis and relieved an obstruction of the ureter, irrigating with boric solution. This procedure was followed by a severe chill, and fever which lasted five days, the temperature reaching 104.4° F. During the following eight days it gradually became apparent that little or no urine was passing through the right ureter. Dr. Adams reopened the lumbar wound and made a digital exploration of the pelvis of the kidney. A yielding elastic diaphragm seemed to intervene between the examining finger and the ureteral opening. The greater portion of the renal pelvis was entirely shut off from the ureter by adhesion of the thinned-out septum, above the lowest calyx, over the ureter.

The kidney was sufficiently bisected to expose this diaphragm in which a cruciform incision was made; this being followed by only slight bleeding the flaps were clipped away, leaving a clear opening of an inch across. Hemorrhage from the renal parenchyma, although at first free, was checked by sterile gauze packing, which was left in position for 36 hours. The patient suffered considerably from shock, but rallied well after two or three days and since has enjoyed good health so far as the renal function is concerned.

GONORRHOEAL PYELITIS,—NEPHROTOMY,—NEPHROLITHOTOMY,—NEPHRECTOMY.

DR. CHARLES ADAMS reported also the case of a man, aged 31 years, who four or five months ago contracted a specific urethritis, mild in character and neglected by the patient, who did not suspect its real nature. Four weeks before admission to the hospital the bladder became involved, the infection traveling rapidly through the ureter to the right kidney. This sudden invasion of the bladder was attributed by the man to a severe strain received in attempting to save himself from falling. Directly following this strain he felt acute pain in the bladder, along the course of the ureter and in the right loin, and there was an increase of the urethral discharge which became blood-stained. At the time of Dr. Adams' examination the man presented the characteristic signs of cystitis, with tenderness of the ureter and enlargement and tenderness of the kidney.

After preparation of the patient by a course of urinary antiseptics and cleansing of the field of operation, the kidney was exposed by Simon's vertical incision, opened through the convexity and from 4 to 6 ounces of pus were evacuated. The renal pelvis and ureter were thoroughly flushed with a one per cent. solution of iodine. Irrigation of the renal pelvis and ureter with iodine or silver nitrate solution was practised every day so long as the lumbar wound remained open. The gonococci which were present in numbers in the pus evacuated from the kidney and that from the bladder at the time of operation were not to be found after two weeks of this treatment. There was still a small amount of pus in the urine at the time of the patient's leaving the hospital, less than four weeks from operation. Directly after leaving hospital the man resumed his work, heavy lifting, etc., about a milk depot, but was not perfectly well, feeling occasionally some pain in the right loin. These attacks of pain after two years increased in frequency and severity, gradually shaping into attacks of renal colic. The urine became more purulent, occasionally bloody, and finally three years from the first operation the patient was compelled to give up work and was again admitted to hospital with tenderness in the right loin, pain extending down the ureter with retraction of the testis and pus and blood-corpuscles in the urine. A diagnosis of renal calculus was made and the kidney again opened and two calculi removed. The progress of the case was quite satisfactory for nearly a month; the wound had healed except for a small sinus left after removal of the drainage-tube, when it became suddenly apparent that blocking of the ureter had occurred. The urine which had been passing almost wholly by the ureter was discharged through the loin, the quantity per urethram being correspondingly lessened; so the wound was reopened and a small flake of calculus material removed from the ureteral opening with forceps. This relieved the condition, and shortly afterward he left hospital with a small sinus discharging a small amount of purulent urine and occasionally calculus material. This sinus persisted for nearly a year, the amount of discharge becoming greater and more annoying until the question of removing the kidney was considered.

During the intervals between operations he led a very active life of real hard work. Every effort had been made by his

attending physician by irrigation, and stimulating injections to stop the suppurative process, but to no avail, so in November, 1901, Dr. Adams removed the kidney.

The kidney presented a pyelitis with much hardening of its parenchyma, and embedded in the renal substance at its lower end was a collection of small calculi.

The resistance of the indurated kidney was such that this deposit could not be felt between the thumb and finger. The man made a prompt recovery from the final operation and has been in perfect health since that time.

Dr. Adams said that he was quite sure that the calculi found in the renal pelvis were formed between the first and second operations, but he was surprised at the complete and sudden disappearance of the gonococcus after its exceedingly active invasion of the bladder, ureter and kidney.

TELANGIECTATIC LIPOMA.

DR. D. A. K. STEELE presented a man 54 years of age who four years ago first noticed a round, semisolid tumor on the back to the right of the spine, about the third dorsal vertebra. At this time he suffered no inconvenience from the growth. On palpation there was no pain or signs of inflammation. From the time the growth was first observed, it had slightly increased in size until the end of the first year, when it was about the size of a large orange. This was three years ago. For the past three years the tumor had grown more rapidly, without causing any pain or inconvenience, until within the last three months, when it was noticed that the growth increased in size rapidly and began to cause some inconvenience from its size.

This growth was 21 inches in diameter, and 61 inches in circumference; its long diameter was 19½ inches and transverse diameter 10 inches. Careful examination would show a number of large venous trunks running over the surface of the tumor, some of them as large as the finger. The growth presented the characteristic feel of a fatty tumor. It was lobulated. Dr. Steele believed that it was not a simple lipoma, but one of those rare mixed forms of cavernous lipomas in which there was a mixture of the greatly enlarged blood-vessels, large lipomatous

lobules or masses typically circumscribed or incapsulated lobules; but running through the meshes of the lipomatous masses were greatly enlarged blood-vessels, the telangiectatic lipoma described by some authors. It was attached rather firmly above and had not from its weight passed down the back.

He had arranged to operate for the removal of this tumor, but thought the case was one of sufficient interest from a diagnostic point of view to exhibit before any operation.¹

INGUINO-PROPERITONEAL HERNIA; INGUINO-INTERSTITIAL HERNIA.

DR. ALBERT E. HALSTEAD reported a case each of inguino-properitoneal, and of inguino-interstitial hernia, with critical remarks. For this paper see page 705.

TUBERCULAR PERITONITIS WITH GREAT DISTENTION OF GALL-BLADDER.

DR. BAYARD HOLMES reported the following case: A man, 38 years of age, first came under his observation in September, 1905. He was married, and had three children, two living and in good health, the other child having died at the age of two of an acute infectious disease. His wife was several months pregnant and in good health.

He had always been a strong, healthy man until the fall of 1902, when he suffered from a severe and protracted pneumonia and pleurisy covering a period of about two months. Following this he was in good health until the fall of 1904, when he suffered severe pain in the right side of the abdomen, associated with considerable fever. He apparently recovered within a week or two. Later, however, in February, 1905, and again in May, 1905, he suffered similar attacks of pain and fever. About July 1, 1905, his finger was crushed in a machine. It healed very

¹ The tumor was excised next day by lifting up the tumor-mass and transfixing its broad pedicle with a very long pedicle-needle threaded with a rubber ligature, which was tied around the two halves of the base, permitting a bloodless excision of the tumor, which weighed eleven and one-half pounds, and on section proved to be a telangiectatic lipoma. The wound healed by primary union, and the patient returned to his home at the end of one week.



FIG. 1.—Telangiectatic lipoma of back.

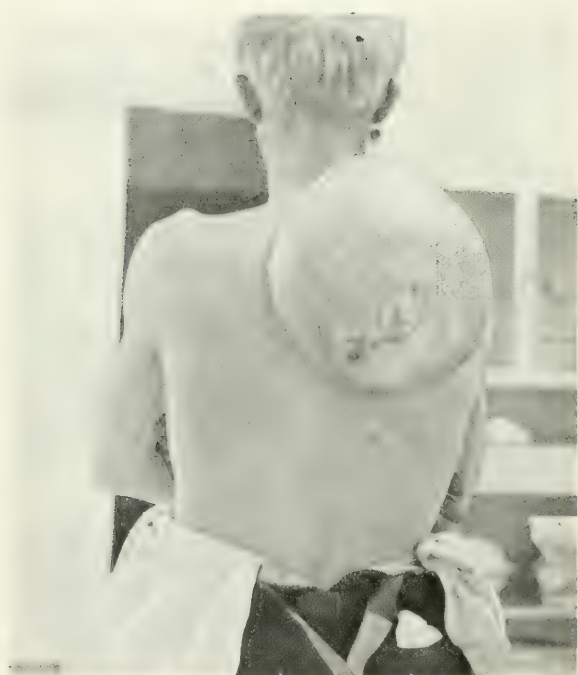


FIG. 2.—Lipoma of back.



FIG. 3.—Lipoma of back.

slowly, and he was unable to return to work. At this time he began also to complain of loss of strength, anorexia, night sweats, and later of enlargement of the abdomen.

DR. BAYARD HOLMES, JR., found him with a temperature of 100, a pulse of 120. His skin and conjunctivæ presented a slight icteric hue, and he was slightly emaciated. The abdomen was considerably enlarged, and the presence of fluid in the abdomen was easily demonstrated. He complained of much pain in the region of the gall-bladder, discomfort after eating, looseness of the bowels, marked weakness, night sweats, and gradual increase in the size of the abdomen. A diagnosis was made of a tuberculous peritonitis, with a probable pus infection of the gall-bladder. He entered Wesley Hospital on September 25. His condition was practically the same, except that he was suffering very severely of pain in the right half of the abdomen, and the increase in size of the abdomen was considerable.

As soon as the anæsthetic was given the abdominal wall relaxed sufficiently to show the presence of a tumor the size of the fist in the region of the gall-bladder. An incision was therefore made on the border of the right rectus, which disclosed a large quantity of a serous, perfectly clear fluid free in the peritoneal cavity, and a gall-bladder so excessively enlarged and tense that it was believed to compress the portal vein and thus produce ascites. This corresponds also with the inability of the patient to take food. The incision was, however, sufficiently extended to introduce the hand, allow the fluid in the lower abdominal and pelvic cavity to escape, and when the abdominal walls were sufficiently relaxed to permit the introduction of the hand and arm, and the careful palpation of all the abdominal viscera. No evidence of tuberculous peritonitis was discovered anywhere, and no pathologic condition except the adhesions between the spleen and the abdominal wall, and the unusual condition of the omentum, which was rolled up in a mass on the lower border of the stomach. The gall-bladder was extirpated and the cystic duct found dilated so that three or four of the haustra contained dark calculi. The contents of the gall-bladder was a thick, mucopurulent fluid. The wall of the gall-bladder was about 3 mm. thick, and its surface was devoid of the natural

appearance of the gall-bladder. The gall-bladder was connected with the common duct by an excessively small cystic duct, which was found to be pervious after the gall-bladder was removed and tested with water under high pressure. The cystic duct was held in a six-inch artery forceps, which extended out of the corner of the wound. It was surrounded with a strip of iodoform gauze. The abdominal wound was closed and a large dressing applied. The quantity of serum which was removed from the abdomen during the operation must have been several pints. During the first two or three days there was an enormous quantity of drainage into the dressings, but no bile. The muscular portion of the abdominal wound closed perfectly, but an abscess appeared in the fat which required the skin incision to be opened. The artery forceps was removed on the third day and the gauze a little later. There was no discharge of bile. By the end of a week the abdomen began to be filled up again, and after making sure that there was no mistake the colon was separated from the anterior abdominal wound and a glass tube with numerous perforations passed into the lower peritoneal cavity through the original incision. This collapsed the abdomen and remained in place for several days. The abdomen never became distended again. The patient now became delirious, had a rapid pulse and low temperature and rapid respiration, averaging 101, 124 and 28. Much symptomatic medication and treatment was given, but the patient rapidly emaciated. The abdominal wound closed except for the skin, but occasionally a little bile would appear in the scar, which seemed to come from the injured surface of the liver. He died five weeks after admission, on the 31st of October.

A necropsy, performed by Professor Zeit, revealed the peritoneum everywhere covered with a recent miliary tuberculosis. There was an acute miliary tuberculosis of the left pleura, tuberculous peribronchitis and broncho pneumonia at the apices of both lungs; chronic fibrous pleurisy of the right lung, œdema of the lower lobes of both lungs; anthracosis of both lungs; acute splenic tumor and tuberculous perisplenitis; acute miliary tuberculosis of the spleen; chronic diffuse nephritis, parenchymatous type, large red kidney, with beginning secondary con-

traction; atrophic cirrhosis of the liver, tuberculous perihepatitis; acute miliary tuberculosis of the liver; nodular arteriosclerosis of the arch of the aorta and thoracic aorta, and fibrous endocarditis of the mitral valves; the gall-bladder absent, and no adhesions.

DR. S. C. PLUMMER, relative to acute tubercular peritonitis following some injury, related the following case: A man received a very hard kick in the right iliac region of the abdomen; there supervened a tympanitic condition, which was more marked in the region of the contusion, but involved the whole abdomen. In view of the severity of the injury, and the tympanites following so rapidly, it seemed possible that there was a rupture of the intestine or some other severe intra-abdominal injury. So a laparotomy was done, but did not reveal any result of the recent injury. An omental adhesion was found which was probably the result of a previous appendicitis for which the patient had been operated upon, the appendix having been removed at the time. The man made an immediate recovery, although there seemed to be more paresis of the bowel than was ordinarily the case after an abdominal operation. About two months afterward he was brought to the hospital again and came into the service of Dr. Schroeder. At this time he had symptoms of acute intestinal obstruction. Dr. Schroeder performed a laparotomy and found very extensive tubercular peritonitis, from which the man shortly afterwards died. At the laparotomy immediately after the injury, he examined all the abdominal contents and did not find any sign whatever of tubercular peritonitis, so that it looked as if the injury or the first laparotomy was the etiological factor in the causation of this tubercular peritonitis.

DR. CHARLES DAVISON said that Dr. Holmes' case reminded him of one he saw in the County Hospital a number of years ago. The patient was in the medical service of Dr. Billings, and was referred to the surgical side with a diagnosis of cholecystitis, with gall-stones, a diagnosis that none would question under any circumstances, inasmuch as the symptoms were as typical of a case of cholecystitis, with gall-stones, as they possibly could be. The patient had had typical attacks of gall-stone colic while in the hospital where they could watch him closely. His

abdomen was opened with the expectation of finding a distended gall-bladder, with stones in it. He could feel a tumor from the outside before operation. After the abdomen was opened, he found a collection of fluid below the liver, above the colon, to the outside of the gall-bladder, accompanied by slight adhesions, the fluid amounting to about ten ounces. The gall-bladder was not thickened, not distended, and contained nothing. The cavity which he opened and drained was studded with miliary tubercles to the naked eye, but he could find nothing of the kind anywhere else in the immediate neighborhood in the abdomen. The cavity was drained, and the patient got well, at least temporarily, so as to leave the hospital. He had not the general appearance of a tuberculous patient. No miliary tubercles were found in any other part of the body. The patient was in apparently good health.

DR. L. L. McARTHUR referred to the careful résumé of the subject of tubercular peritonitis by Fürst in his monograph on Intestinal Tuberculosis. In this he demonstrates, by going over the work of a large number of pathologists of note, that tubercular peritonitis is often secondary to a primary tuberculosis of the intestines or mesenteric glands, and primary in the true sense. Not clinically primary, simply, but because of the passage of microörganisms through the even uninjured mucosa into the lymphatic glands, and from the lymphatic glands creating a peritoneal tuberculosis. We might hope in the future to operate far more early than in the past, perhaps before the period of ascites had developed. By the removal of the enlarged lymphatic glands that not infrequently could be clinically palpated, we might both cure the patient symptomatically and prevent those later stages which were so frequently hopeless. He, too, had furnished evidence which, to the unbiased mind, went to prove that occasionally primary peritoneal tuberculosis resulted from the swallowing of the bovine bacillus. Koch has lately turned so squarely against his former dictum as to say it never produces a human tuberculosis. Nevertheless, cases are now to be found in the literature, as quoted by Fürst. He thought if we had the opportunity to make earlier operative interference we could save many cases now lost.

DR. DANIEL N. EISENDRATH said the case of Dr. Holmes brought up the subject of the acute onset of tubercular peritonitis. He had met with two cases of this kind, which he would relate. One of them was a young man whom he saw last spring on account of what appeared to be a tumor in the abdomen. The patient stated that two months previously he was taken sick at Indianapolis with a sharp pain in the right iliac region, and the physician who treated him for appendicitis told him there was no question but that he had appendicitis.

Dr. Eisendrath saw the patient two months later, when he had a prominence to the right side at about the level of the umbilicus, which fluctuated distinctly. He could replace it and palpate it bimanually. The tentative diagnosis was that the tumor had no connection between appendicitis, and it was thought that the case was one of hydronephrosis or mesenteric cyst. On opening the abdomen a large abscess cavity was found which extended upwards, which was limited strictly to the median line, extended downwards to the region of the appendix, a little above and backwards as far as the midaxillary line, upwards to the middle of the liver. The case turned out to be one of encapsulated tubercular peritonitis, which had begun very acutely with a sharp pain, as described.

In a second case, a woman had been taken sick rather suddenly, with a temperature ranging from 103° to 104° . She had all the symptoms of typhoid, and had been treated for six weeks. He thought the woman had tympanites. When Dr. Eisendrath saw her she had free fluid in the peritoneal cavity; also a high temperature. The case proved to be one of typical tubercular peritonitis. This form of acute peritonitis with sudden onset resembling typhoid fever is recognized and described in Osler's text-book.

DR. A. J. OCHSNER said that, in looking over the literature of tubercular peritonitis some three years ago for the purpose of preparing a paper, he found some very interesting facts which seemed not to have been generally put together. In the first place, it seemed from the literature that the early cases, which apparently appeared hopeless, and were found by accident, almost all were reported as having recovered. This may be accounted for

by the fact that if they did not recover the cases might not have been reported, or by the fact that nothing beyond an exploratory incision had been made. It seemed that for a number of years the cases that were reported were those in which surgeons had made wrong diagnosis. They had diagnosed a cyst, had opened the abdomen, had inserted a drainage tube, and told the friends that the case would be fatal, and it was a great surprise to them when these patients did not die. Presently the diagnosis was made beforehand and various surgeons began to operate for this condition, shortly after which there was a great change noticed in the results. This change came about in this way: As the operation became more thorough, the mortality materially increased, so that when surgeons began to do really a thorough operation, they could count on losing a large proportion of their cases; but if they took the same class of cases apparently and did nothing but an exploratory laparotomy the patients would recover. This went on still further until some foreign observers found that these patients when treated without operation recovered in about fifty per cent. of the cases. The diagnosis, however, was not as positive as when the patient was operated. Cases of tubercular peritonitis that were operated upon also recovered to the extent of about fifty per cent. About that time, he said, Professor Fenger published a paper in which he brought together all of the various facts and theories, and came to the conclusion that it was very doubtful whether operative treatment did harm or good in these cases. But in looking over his own experience, which at that time covered quite a large number of cases, and in taking all of the facts together, it seemed to Dr. Ochsner that he was entitled to draw this conclusion, that in case those patients were not operated on in whom a diagnosis of tuberculous peritonitis had been made, the probabilities of recovery were fifty per cent.; that among the remaining fifty per cent. of cases if they were not operated on there would be no recovery. If operated upon, there would still be fifty per cent. recover, and it seemed, from the observations of a number of surgeons and from experimental observations, that operation was especially desirable in cases which did not improve with internal and dietetic treatment. Operating a certain class of cases which

showed improvement with internal treatment, there was no greater percentage of recovery in this class than there was in cases which refused to improve without surgical treatment, so that it seemed, in treating all patients surgically from the beginning, there would be a recovery of only fifty per cent., and in treating those that would not improve under medical treatment there would still be a recovery of fifty per cent. Experimental work on animals by several observers showed that an early artificial tuberculosis did not improve with drainage to the extent that the cases did in which they allowed the tubercular peritonitis to become chronic. Those that were older recovered more rapidly with drainage than those that were operated early, and the explanation was that these animals developed a certain condition which enabled them to manufacture their own antitoxin out of the residue of their tuberculosis after drainage had been established.

In the speaker's own cases of traumatic tuberculosis, the same as in the case reported by Dr. Plummer, and in a number which he had found in the literature, the progress was very rapid as compared to cases of tubercular peritonitis in which there was no definite traumatic origin.

He had operated upon a patient for gastric ulcer, with pyloric obstruction. There was at this time no sign of tuberculosis of the peritoneum, but within six months the patient returned with symptoms of obstruction, and it seemed to him that something had gone wrong with the operation. But upon opening the abdomen it was found that these symptoms of obstruction were due to a very violent diffuse tuberculosis of the peritoneum, from which the patient had recovered under treatment.

The observations of Mayo in regard to tubercular peritonitis and tuberculosis of the intestines were of great value, because they had brought out clinically a fact that Dr. McArthur had mentioned, namely, infection through the intestine. The cases of patients that Dr. Mayo reported all came from a portion of the country where pulmonary tuberculosis is exceedingly rare. They practically all came from families in which there was no tuberculosis; they all came from families in which raw milk was used to a great extent, and these patients had nothing to indicate that they should have tuberculosis except the local conditions. Again,

practically all of them got well as soon as the abdomen was opened and drained, and they had remained well as long as they took sterilized milk afterwards. This, he believed, was the strongest anti-Koch demonstration that had been made.

DR. D. A. K. STEELE within the last two weeks had operated on two cases of tubercular peritonitis, one thirteen days ago, the other nine days ago. The patient upon whom he had operated thirteen days ago was a young Assyrian woman, who had many irregular, nodular tumors which could be felt in the abdomen. As he opened the abdomen he found the mesenteric glands were enlarged, together with some thirty or fifty others, which were the size, some of them, of a hazelnut, while others had attained the size of a hen's egg. It seemed rather formidable to shell out all of them, as the intestines were intensely injected. There was no evidence apparently of tubercular peritonitis, but he took it to be a tuberculosis of the mesenteric glands, involving all the glands in a profuse manner. He shelled out one of the glands for diagnostic purposes, closed the abdomen, and left the other glands in.

He asked Dr. McArthur whether in a case of this kind he would have removed all of the glands that were involved?

DR. L. L. MCARTHUR, in replying to the question of Dr. Steele, related a case in the person of the child of a surgeon of Boston, who had a sudden onset of the type of abdominal trouble that resembled in its characteristics very much an appendicitis. When he was operated upon for the supposed appendicitis, there were found innumerable enlarged lymphatic glands, such as Dr. Steele had described, in a child, nine years of age. These glands the operator continued to remove until the child was almost in a state of collapse. However, the child was perfectly well to-day, and to the speaker's mind had a typical case of *tabes mesenterica*, which, had it been allowed to go on, would have developed finally peritonitis, exhaustion, and ascites as a final result. Earlier operations both for intestinal tubercular ulceration, for tubercular appendicitis, and for tubercular gland infections, without observable lesion in the mucosa of the tract (bacilli have been artificially made to pass by food experiments into these glands, without an abrasion being demonstrable in the mucosa), would show such

changes in treatment as had occurred in the evolution of surgery of the appendix. The remarkable changes which occur in the peritoneum by the mere opening of the abdomen he saw in his own child, who suffered with an appendicitis, on which he thought a tubercular implantation had occurred from infected milk. Dr. Bevan did a laparotomy, finding such a general miliary tuberculosis of the peritoneum as one rarely saw. Scarcely an inch of the peritoneum was without distinct miliary tubercles. The peritoneum covering the intestines, covering the abdominal wall, covering the mesentery, was alike invaded. There were glandular masses as large as a fist in the mesentery. The entire omentum was caked, yet twelve months later, on opening the abdomen for the relief of the hypertrophied tuberculosis in the ileocaecal region, every trace of the miliary tubercles had disappeared, or was not to be detected. The lymphatic masses had almost disappeared in the mesentery, and the omentum had become more soft and normal-appearing. The opportunity was presented to see the influence of a simple abdominal opening; the total disappearance of the miliary tubercles.

DR. A. E. HALSTEAD said that he reported a case three years ago at a meeting of the American Medical Association of miliary tuberculosis of the abdomen that he had operated on. A diagnosis of acute appendicitis had been made. A large number of enlarged mesenteric glands were found, so many that it was not thought wise to remove them. Some of these glands were as large as a hen's egg, and the abdominal cavity was studded with tubercles. The patient finally recovered after about three months, and was sent to Colorado. Later, she developed a post-operative hernia. On returning to Chicago at the end of three years, she had apparently recovered from the tuberculosis. He operated on her for the hernia, inspected the abdominal cavity at the time, and was unable to find even a trace of the previous peritoneal tuberculosis, excepting that here and there was a small calcareous body representing a gland. She was absolutely free from all evidence of tuberculosis.

This case, and the one reported by Dr. McArthur, he thought, would indicate that operative treatment, as far as removing the glands is concerned, would not appear to be so essential. It

would seem to him to be an operation of great magnitude to remove all the glands, and if these patients recovered without such an operation by simply opening the abdomen and treating the case as one of tuberculosis, from a hygienic and dietetic point of view, it would seem that operation in these cases might not be really necessary.

DR. HOLMES, in closing the discussion, reiterated his belief that the big gall-bladder had produced in his case in the course of less than a week enormous ascites by pressure upon the portal vein, and he thought that the ascites was a predisposing factor toward the localization of the tuberculosis in the peritoneum, and that the peritoneal tuberculosis was only a part of a general miliary tuberculosis which had showed itself in the lung and in the capsule of the liver and genito-urinary organs. Again, he thought that the miliary tuberculosis was probably stirred up by the cholecystectomy and by the examination which he made at that time, which disclosed no adhesions in the abdominal cavity except over the spleen. It was possible that there was a perisplenitis of tuberculous origin, but he could not say so definitely. The cervical region of this gall-bladder contained a few nodules which he carefully examined microscopically, but did not prove to be tuberculous. The gall-bladder had a few times been discovered as tuberculous, but nearly always in cases of rather general tuberculous infection. (Sergeant: Thesis, Paris, 1895.)

In regard to the removal of enlarged tuberculous lymph-glands in the mesentery of the intestines, he expressed himself as being of the same opinion as Dr. Halstead and some of the other speakers, that they should not be removed.

He remembered operating on a woman for obstruction of the bowels on whom Dr. Charles T. Parkes had made a diagnosis of an ovarian tumor many years before. This tumor had miraculously disappeared under Dowieism, which prevailed in that neighborhood at that time. This emergency laparotomy was performed in the patient's house with an assistant, the attending physician and the twin sister of the patient. When the abdominal wall was opened a number of hard, cheesy tuberculous glands presented themselves, which confirmed the diagnosis of tuberculous peritonitis of the dry variety. During an hour's

fruitless search for the obstruction six intestines were opened accidentally and closed again. The patient was in collapse, vomiting fecal matter and almost pulseless, when the wound was tamponaded with iodoform gauze and the abdominal incision, which reached nearly the whole length of the abdomen, closed. The patient was not expected to live, but showed herself in perfect health four or five months later.

He once operated upon a patient with tuberculous peritonitis on the diagnosis of appendicitis and found the peritoneum covered with tubercles and the tubes as large as the thumb. A few months later operating for hernia on the same patient no evidence of the former findings could be discovered.

He had observed the fact that the tuberculous peritoneum could withstand an enormous amount of traumatism with good effect. He had operated upon a little boy with a diagnosis of right hydronephrosis, and had discovered a general tuberculous peritonitis with an effusion into a peritoneal sac simulating an enormously distended right kidney. The abdomen was drained, and the patient did well for a few days. One morning the nurse informed him that the abdomen had broken open, and that the intestines were all in the dressing. This was discovered to be the case. They were carefully washed off and replaced, and the abdominal wound closed again. The patient made a prompt and perfect recovery.

He believed that tuberculosis confined to the peritoneum was amenable to surgical treatment. When the primary focus in the appendix, the tubes or other mucous membrane could be discovered, it should be removed. He had never attempted this himself, and always drained as little as possible through a small incision in order to diminish the chance of hernia.

PARTIAL GASTRECTOMY FOR CARCINOMA.

DR. D. W. GRAHAM exhibited a specimen taken from a man, 60 years of age, who gave a history of gradually failing health for six or nine months previous to operation. There was no obstruction of the pylorus apparently, but there was greatly disturbed nutrition and digestion, stasis, and occasional vomiting. Operation was undertaken, first, as an exploration. A tumor could be felt through the abdominal wall and it was found

to involve the stomach some little distance away from the pylorus and implicated the anterior wall largely. There were no adhesions. The tumor was freely movable, and as there were no adhesions he considered it a good case for partial gastrectomy.

There were several interesting features about the tumor itself. There was beginning contraction to make the hour-glass form of the stomach. This contraction involved more particularly the lesser curvature. The tumor had toadstool-like or cauliflower-like projections on the inner wall of the stomach. There was apparently normal mucous membrane between the various toadstool-like projections. The glands along the lesser curvature were felt to be enlarged, as well as along the greater curvature.

The patient died on the fourth day after operation, from peritonitis. He thought leakage had taken place along the line of suture of the stump. The stomach was amputated at the pylorus, then a little more of the pylorus was removed, and the pylorus sutured in the usual way. A posterior gastroenterostomy was made. It was rather difficult to get the line of junction right. He used clamps after Moynihan's method of procedure, and thought in so doing he disturbed the suture line, and that leakage followed the operation. However, when the tumor was removed, water was put in at two points, and the lower point tied, but no leakage was apparent. Nevertheless, he thought the point of leakage was due to disturbance of the suture line in making the gastroenterostomy and that it had been covered up by the exudate which took place before death.

The glands were all removed up to the root of the œsophagus, but there was an enlarged gland left (as shown in the specimen) which was undoubtedly carcinomatous. The lesson to be drawn was that the surgeon should strip all fatty areolar tissue from the vessels and from the base of the œsophagus in gastrectomy. He thought, if there was any fault in connection with the operation, it was in getting the line of junction of the jejunum too close to the line of suture of the stomach.

CORRESPONDENCE.

BENNETT'S FRACTURE OF THE METACARPAL BONES.

EDITOR ANNALS OF SURGERY:

IN my article on "Fractures of the Metacarpal Bones" in the February issue of the ANNALS my correction of the proof, in regard to the frequency of Bennett's fracture, was overlooked or failed to reach you. Since my attention was first called to this injury I have been on the lookout for it. Within the past year I have seen seven cases. I now regard it as the most important fracture of the metacarpal bones and the one most frequently overlooked.

RAYMOND RUSS.

SAN FRANCISCO, March 8, 1906.

CONNELL'S STITCH.

EDITOR ANNALS OF SURGERY:

THE foot-note on page 198 of Dudley Tait's article in the February ANNALS, prompts me to ask that you publish the following quotation, taken from my remarks on page 93, "Transactions, Mississippi Valley Medical Association, Vol. IV.":

"This method is merely a modification of that of M. E. Connell. That method did not meet with general adoption because of the penetration of all coats of the bowel-wall. It was in an effort to remove this objection to, and to improve upon, the older method, that I succeeded in placing the knot within the lumen upon the mucosa. This is practically the only difference between the method of M. E. Connell and the continuous suture that I have described."

F. GREGORY CONNELL.

SALIDA, COL., March 11, 1906.

BOOK REVIEWS.

A TEXT-BOOK OF PRACTICAL THERAPEUTICS; WITH ESPECIAL REFERENCE TO THE APPLICATION OF REMEDIAL MEASURES TO DISEASE AND THEIR EMPLOYMENT UPON A RATIONAL BASIS. By HOBART AMORY HARE, M.D., Professor of Therapeutics and Materia Medica in the Jefferson Medical College of Philadelphia. New (10th) edition. Lea Brothers & Co., Philadelphia and New York. 1904.

Materia Medica and Therapeutics as taught in most of our medical schools to-day leaves the student with only a hazy idea of a collection of drugs which have certain definite effects upon the various functions and tissues of the body. The drugs are memorized and their dosage learned, but their practical application in disease is seemingly a secondary consideration in the eyes of those who are teaching the subject, so that when a man starts in his actual work he rarely knows how and what to prescribe in the cases which come to him for treatment. Even hospital training is deficient in this regard. In most institutions the drugs are put up in favorite combinations known for example as the "D. T. Mixture," "Pneumonia Cough Mixture," etc., and the interne gives a certain dose of one of these mixtures without really knowing the constituent parts of it.

In private practice then the young physician is confronted with the problem of "What shall I give, and how shall I give it?"

The present volume is designed to answer these questions, and does so in a way which makes it valuable to its possessor as a reliable and well-organized book of reference.

The arrangement of the text is admirable, and its double index, the one of Drugs and Remedial Measures, the second of Diseases and Remedies, greatly enhances the value of the book.

The book is in its tenth edition, much enlarged, thoroughly revised and largely re-written.

PAUL M. PILCHER.

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ORIGINAL MEMOIRS.

AFFECTIONS OF THE THYROID GLAND.

A CLINICAL AND PATHOLOGICAL STUDY.¹

BY GEORGE EVERETT BEILBY, M.D.,

OF ALBANY, N. Y.

(From the Bender Laboratory, Albany, N. Y.)

DURING the past few years as a result of the great advances in the surgery of the thyroid gland, the study of the many diseases of this organ has been placed upon an intelligent clinical and pathologic basis. There still remains, however, a lack of uniformity not only in the classification of the various lesions but also in the interpretation of their etiology and their pathologic significance. It was with the object of adding, if possible, to our orderly knowledge of the pathology of the thyroid that this study of a large series of cases was undertaken.

Material.—Since the opening of the Bender Laboratory, in 1896, a period of about ten years, material removed at operation from sixty-one cases of thyroid disease has been examined. It is upon this material, mainly from the surgical clinic of the Albany Hospital, together with three of my own cases, that this present study is based. Including, as it does, examples of all of the more important affections of the thyroid gland, with careful gross and microscopic descriptions, this

¹ Read before the Medical Society of the County of Albany, February 14, 1906.

group of cases offers unusual opportunities for investigation.

This material may be classified as follows:¹

Class.	Disease.	No. of Cases.
I.	Simple hypertrophy.....	26
II.	Adenoma	9
III.	Recurrent adenoma	3
IV.	Cyst	12
V.	Metastatic thyroid tumor	1
VI.	Exophthalmic hypertrophy	6
VII.	Chronic thyroiditis	1
VIII.	Tuberculosis	2
IX.	Carcinoma	1

These lesions fall naturally into three groups,—the hypertrophies, the tumors, and the inflammations,—and should perhaps more properly be discussed in this order. Several departures however will be made in order to more clearly present the relations of the various lesions. Simple hypertrophy and adenoma as they possess, histologically, much in common, will be considered in sequence, thus affording a better opportunity for differentiation. The exophthalmic type, aside from the fact that it represents a diffuse process, bears no points of resemblance either clinically or pathologically to the simple colloid form and will therefore be considered by itself. The cysts have been found to have such close relationship to the adenomata that they may be considered with the latter.

In the study of each type of lesion, a systematic manner of presentation will be pursued as far as possible. First, a tabulated list of the cases, giving the age of the patient at the time of operation the age of onset, the duration of the disease

¹ To these might be added, to make a classification complete, the sarcomata, the fibromata and the mixed tumors, together with acute thyroiditis, all of which are very rare affections and have not occurred in this series.

I wish here to express my thanks to Dr. Pearce for the privilege of using the material at the Bender Laboratory, and also indirectly to Dr. Blumer, whose careful records has made this study possible. Also I wish to thank the surgeons of the Albany Hospital, especially Drs. Vander Veer, Macdonald and Elting, who have allowed me access to their clinical records.

and the ultimate outcome when possible, will be presented. Following this one or more typical cases will be related in detail, with a brief clinical note and a complete pathologic study. When other cases offer points of interest or importance, not already covered in the quoted cases, attention will be directed to these special features in the general discussion. The etiologic and pathologic significance of the group as a whole will then be considered, and finally, after the consideration of each separate group, a résumé will be made of the main points in diagnosis and treatment of thyroid lesions in general.

I—SIMPLE HYPERTROPHY (COLLOID HYPERTROPHY). TWENTY-SIX CASES.

No.	Age of onset.	Age at operation.	Duration.
1.....	22	23	16 mos.
2.....	24	25	12 "
3.....	..	68	
4.....	13	13	6 "
5.....	..	..
6.....	..	..
7.....	..	30	
8.....	24	25	12 "
9.....	..	43	
10.....	..	42	several years
11.....	42	43	1½ "
12.....	40	43	3 "
13.....	16	18	2 "
14.....	24	27	3½ "
15.....	13	23	10 "
16.....	13	15	2 "
17.....	32	40	8½ "
18.....	44	62	18 "
19.....	11	18	7 "
20.....	..	..
21.....	15	49	34 "
22.....	..	47	
23.....	36	53	17 "
24.....	..	..
25.....	..	56	
26.....	..	28	

Average age at onset, 24 years; average age at operation, 36 years; average duration, 7 years, 4 months; females 21, males 3, sex not stated, 2.

CASE I.—(Path. No. 05-1011.) Male, aged 18; for 7 years has had enlargement of the neck with at times dyspnœa and some prominence of the eyes noticed. His mother is said to have had the same condition.

Physical Examination.—A symmetrical enlargement of the entire neck anteriorly and laterally, but slightly greater on the right side, is seen. The enlargement extends outward and backward on either side and is felt deep under the sterno-cleido-mastoid muscle.

Operation, June 15, 1905, by Dr. G. E. Beilby. Cocaine. Transverse Kocher incision. The thyroid gland, with the exception of a portion of the upper part of the left lobe about 4x4 cm. in extent, was removed without difficulty. The right lobe is larger than the left and extends more deeply into the tissues.

Patient made an excellent recovery. In January, 1906, the patient's health was excellent.

Pathology—Macroscopic Examination: Specimen consists of a thyroid gland showing distinctly right, left and median lobes. Weight 530 grammes. Left and median lobes have been removed entire; a portion of right lobe is absent. The left lobe measures 12.5x5x4 cm., the median 4x2 cm. and the right 10x5x6 cm. The mass is definitely encapsulated, of firm consistence, distinctly lobulated and of a dark red color. The blood-vessels of the capsule are very large and tortuous. The right and left lobes are somewhat symmetrical and more or less kidney-shaped, with flattening of the posterior surfaces. The right lobe is of somewhat greater diameter antero-posteriorly than the left. On section right lobe is seen to be grayish yellow in color and from the cut surface escapes a thick gelatinous material. It is lobulated; the lobules being composed of numerous alveolar spaces the walls of which are formed of rather firm bands of connective tissue and in which is a colloid material of a clear translucent appearance. Very many large blood-vessels are seen on section. No cysts are present. The left lobe is similar in all respects to the right.

Microscopic Examination.—Sections from four different portions of mass all show practically the same condition. In general the structure is that of the normal thyroid gland. The gland acini however, are greatly dilated and filled with a homogenous colloid material which stains with eosin. These acini for the most

part are lined with a single layer of cuboidal epithelium. In many are blood-corpuscles and cholesterol crystals. The capsule of the gland is very delicate, and there is but a moderate amount of connective tissue throughout the gland substance.

Microscopic Diagnosis.—Simple colloid hypertrophy.

CASE II.—(Path. No. 97-5). Female, aged 23, single. History of enlargement of the neck in the region of the thyroid for 13 years. The enlargement has gradually increased. Recently patient has complained of dyspnœa, dysphagia and nervousness. No exophthalmus.

Operation.—November 15, 1897, by Dr. Macdonald.

Pathology.—Macroscopic Examination: Specimen consists of a lobulated mass of tissue of firm consistence, measuring 12x6x4 cm. It is divisible into two lateral lobes and a central portion, which probably represents the original thyroid gland. The surface is smooth for the most part, but in places, particularly posteriorly, is covered by vascular adhesions. The cut surface has a yellowish gray color, is irregularly divided into lobules, and is dotted here and there with cysts, containing a yellow, jelly-like material. This surface is smooth and glistening and covered with a translucent, sticky material. There are no signs of old or recent hæmorrhage into the gland substance.

Microscopic Examination.—The tumor consists of tissue having in a general way the appearance of thyroid gland. It differs from this structure only in a marked increase in the size of many of the gland acini which contains a large amount of colloid material. *Microscopic Diagnosis.*—Simple colloid hypertrophy.

CASE III.—(Path. No. 05-996). Male, aged 60. History of goitre for 18 years which, though of large size, caused no symptoms until two months ago, when severe dyspnœa and dysphagia developed.

Operation.—September 26, 1905, by Dr. Elting.

Pathology.—Macroscopic Examinations: Specimen consists of a flattened encapsulated dark red mass of tissue measuring 11x8x5 cm. having the general appearance of an enlarged thyroid gland. One surface is irregular in form and is covered by fine adhesions; the other surface shows irregular lobulations separated one from another by deep fissures. The capsule contains a rich plexus of veins. Loosely attached to this mass is another

similarly encapsulated mass 6x3.5x2.5 cm. which is pinkish red in color, lobulated and the seat of numerous small cysts. The surface is covered with fine adhesions. The cut surface of the larger mass shows a greatly thickened capsule surrounding well-marked lobules which have a smooth, glairy surface, and appear to be filled with colloid material. The smaller mass on section shows a similar capsule, paler in color and with smaller, less well-marked lobules, and numerous small cysts filled with yellow blood-stained fluid.

Microscopic Examination.—Sections show structure of thyroid gland with capsule greatly thickened. The acini are greatly increased in size and number and filled with colloid. There is no increase in the interstitial substance or in the cells lining the acini.

Microscopic Diagnosis.—Simple colloid hypertrophy.

These three cases illustrate very well this type of enlargement. It is characterized clinically by symmetrical increase in size, which is usually not rapid but extends often over many years. It is true that one lobe may be larger than the other, but the essential change is a diffuse involvement, and the term "simple goitre" or "simple hypertrophy" should be applied only to those lesions which thus involve the entire gland.

Histologically, the characteristic feature is a dilatation of the thyroid vesicles, the result of the increased colloid secretion. There is lack of uniformity in the size of the vesicles, but it is rare to observe any portion of the gland which shows normal vesicles. The connective-tissue stroma in the earlier cases is often found to be somewhat scant but definite lobulations can always be made out. After the condition has existed for a number of years secondary changes may produce a rather complex picture. These are most frequently hæmorrhage into the alveoli, with associated degeneration and pigmentation in focal areas. Infiltration of leucocytes and lymphoid and plasma-cells is not infrequent. The connective tissue in cases of long standing is usually very abundant. Calcification is common as a late degenerative change. Cysts of large size in a gland showing simple hypertrophy have not been observed. Minute smooth walled cysts formed evidently by

the rupture of the walls of adjacent vesicles, with fusion of their colloid contents, are commonly present.

Etiology.—It will be remembered that in the early embryonic thyroid colloid is not present in the epithelial vesicles. The colloid secretion makes its appearance at about the time of birth and first in small amounts, but with the advancing age of the child the individual vesicles show increased dilatation; the gland probably attaining its most active secretory stage during youth or early adult life. An enlargement of the thyroid at this period is very common, but it usually disappears at twenty-three to thirty years of age. This enlargement probably represents a simple hypertrophy of the organ. In explaining this condition of simple hypertrophy, then, it seems proper to infer that in a certain number of cases, instead of a subsidence of this physiologic hypertrophy, the process in an exaggerated form continues and a permanent hypertrophy is the result. In this series it is seen that while before twenty years of age only four cases came to operation, in six the age of onset was before twenty and in four others, in which the age of onset is stated, it was between twenty and thirty years, making nearly one-half of the recorded cases appearing either in youth or early adult life. Pregnancy in a few instances has apparently been the exciting cause.

In simple hypertrophy there is as a rule no symptoms except those produced by pressure upon the structures of the neck. Circulatory disturbances with extreme enlargement seem to be fairly common. Vertigo, which is frequently a symptom, is due, possibly, to pressure of the enlarged gland upon the blood-vessels of the neck. The duration of the condition varies greatly, for the patient seldom seeks advice until the pressure symptoms become severe. Mere deformity causes no concern, but when respiration or deglutition becomes difficult relief is sought. The periods of time represented in these cases vary from a few months to thirty-four years. The size to which the gland may attain also varies greatly. There seems to be no relation between the duration of the condition and the size

of the gland. The case showing the most extensive hypertrophy in this series is Case I, quoted above.

In the condition of simple hypertrophy, then, three things may occur. First, there may be a subsidence of the active secretory process after puberty or during young adult life, and a diminution of the amount of colloid present with a return of the gland to its normal size. These are the cases of moderate enlargement. Second, the epithelium may cease to secrete colloid material after a certain age is reached, but fail to undergo retrogressive changes and the enlargement become a permanent one. Instances of this nature are frequent. The hypertrophy is of moderate degree causing as a rule no subjective symptoms, and but rarely demanding operation. Third, a condition similar to No. 2, in which in addition we see in later life, after a quiescence of many years, a rapid increase in the size of the already hypertrophied organ. This enlargement is apparently due to two causes—an increase in the colloid secretion, as observed in the primary enlargement, and an actual reproduction (hyperplasia) of thyroid tissue. This latter is apparently the process present in the majority of cases. Only a portion of the gland may be secondarily affected. The following case, which clinically was considered to be malignant, illustrates this type.¹

CASE IV.—(Path. No. 05-1114.) Female, aged 53, goitre with slow growth for 17 years. First began during pregnancy. During the past seven months the enlargement has been rapid and confined chiefly to the left lobe. Dyspnoea and dysphagia marked.

Operation, October 25, 1905, by Dr. Vander Veer. Considerable difficulty was experienced in removing the gland, owing to its deep attachments.

Pathology.—Macroscopic Examination: Usual appearance of old hypertrophic gland with increase of connective tissue, degeneration and calcification in areas, but in addition a large amount of comparatively normal thyroid tissue, differing perhaps in that it has a more cellular appearance.

¹Under "Carcinoma" will be discussed the frequency with which hypertrophied glands of this nature undergo carcinomatous changes.

Microscopic Examination.—The sections show in general a simple hypertrophy with fairly large colloid vesicles lined by the usual epithelium. Here and there, however, are areas of small vesicles, some filled with cells and others containing a little colloid representing young thyroid tissue in various degrees of development. Small masses of epithelial cells are not infrequently observed outside of the colloid vesicle and probably represent focal zones of new thyroid tissue or compressed epithelial vesicles.

The histologic appearance in this case suggested the possibility of carcinoma. There is, however, no definite evidence of invasion of the old connective-tissue stroma by the new-formed thyroid tissue. This is a histologic picture frequently observed in cases of old simple hypertrophy in which there has occurred recent growth. Patient made a good recovery from the operation and was well six weeks later.

II.—ADENOMA; 9 CASES

No.	Age of onset.	Age at operation.	Duration.
1.....	..	38	
2.....	16	21	5 yrs.
3.....	37	55	18 "
4.....	..	24	
5.....	18	23	5 "
6.....	25	26	8 "
7.....	35	40	5 "
8.....	28	30	2 "
9.....	..	43	

Average age at onset, 26 years; average age at operation, 33 years; average duration, 7 years; female, 8; male, 1.

CASE V.—(Path. No. 755). Male, aged 55. Onset of tumor 18 years ago in the region of the thyroid. Has grown larger during the last two years. No symptoms except tumor.

Operation, September 26, 1904, by Dr. Elting. Excision of tumor of left lobe. The right lobe and isthmus seemed normal.

Pathology.—Macroscopic Examination: Specimen consists of an encapsulated tumor of the thyroid, measuring 8x6x3 cm. Tumor mass has been cut open. On section it presents a rough nodular surface mottled with dark red areas. Surrounding these

is a brownish yellow zone and still further out a deep red finely granular zone. The lighter areas are approximately 1x.5 cm., the dark red areas measuring about 2x1 cm.

Microscopic Examination.—There is distinct hyperplasia of both glandular and interstitial tissue, the glandular elements in places being massed together and compressed, with irregular outlines; in other places dilated and filled with colloid material; in still other areas the glandular elements are atrophied with marked increase of interstitial tissue, which is highly œdematous and hyaline.

Microscopic Diagnosis.—Mixed adenoma of thyroid gland.

CASE VI.—(Path. No. 05-1207.) Female, aged 23. Tumor for 5 years. Rapid enlargement during the past eight months; dyspnœa. Tumor of the right lobe pushing the trachea and larynx to the left.

Operation, November 14, 1905, by Dr. Elting.

Pathology.—Macroscopic Examination: Specimen consists of a definitely encapsulated tumor 10x5x8x6 cm. Capsule is smooth and apparently free from adhesions. At one pole is a small irregular tumor. The capsule is very dense and fibrous. On section the tumor presents a uniform grayish appearance. Tissue is exceedingly soft and friable. No fibrous bands are seen. In the centre of the mass the tissue is disintegrated and there is found a small cavity filled with blood-stained colloid material. On section, the smaller tumor attached to one pole of the larger has the appearance of normal thyroid tissue and evidently represents the isthmus of the thyroid gland.

Microscopic Examination.—(See Fig. 1.) The general structure of thyroid tissue can be seen, but there are no definite lobulations as are found in the normal and hypertrophied gland. The thyroid vesicles, however, are greatly enlarged and filled with a homogeneous colloid material which stains with eosin. In some areas the epithelium lining the individual vesicles has disappeared and their contained colloid has coalesced, forming large irregular pink-staining masses. Throughout the colloid material is seen isolated cells and clumps of cells which stain poorly and which represent the desquamated epithelium. There are also numerous red-blood cells. When an epithelial lining is present instead of a

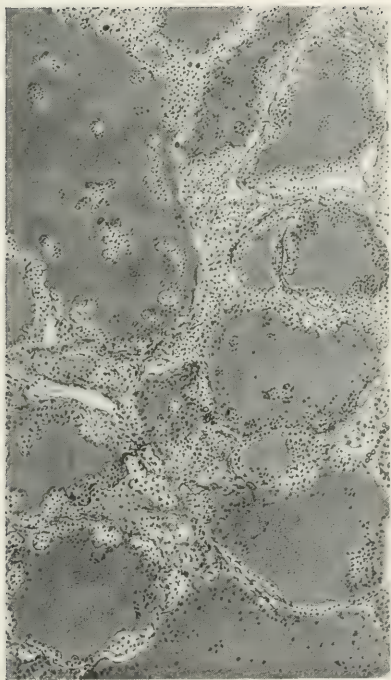


FIG. 1.—Microscopic drawing of a colloid adenoma, 4 oc. 3 obj. Leitz.

The illustration shows that the thyroid vesicles are distended with a homogeneous colloid substance in which are clumps of epithelium and isolated epithelial cells.

single layer of cells we see often several layers, and here the cells stain very poorly and have no definite arrangement. The connective-tissue stroma is very scant and the alveolar walls are delicate. There are a few small epithelial vesicles which contain no colloid and represent young thyroid tissue. The general picture is one of early degeneration.

Microscopic Diagnosis.—Colloid adenoma of the thyroid.

CASE VII.—(Path. No. 64-5.) Female, aged 26. Duration of illness 8 months. The prominent symptoms are pain, dyspnœa and dysphagia.

Operation, February 20, 1899, by Dr. A. Vander Veer. No note on operation.

Pathology.—Microscopic Examination: Specimen consists of a globular nodule measuring $4 \times 3 \times 1.5$ cm. It is completely encapsulated. Its outer surface is covered here and there with torn adhesions which are attached to the capsule. The nodule is soft in consistence. On section the cut surface bulges somewhat; it is mostly of a grey-white color and rather translucent in appearance. Scattered through it are a few whiter areas suggestive of necrosis and one or two minute hæmorrhagic points.

Microscopic Examination.—The section shows both the capsule and tumor substance. The capsule is composed of several layers of fibrous tissue, in the outermost layer of which can be seen compressed thyroid vesicles probably the result of the encroachment of the growth upon the normal gland-tissue. The tumor proper is made up of closely packed epithelial vesicles, which as a rule are empty or have only a cellular content. In this respect the tissue resembles that of the foetal thyroid, but differs in that the cells are of a higher type. In some of the vesicles, farthest from the periphery, there is a small amount of colloid present, this probably representing the oldest portion of the growth. The connective-tissue stroma is very scant and there are no lobulations visible.

Microscopic Diagnosis.—Mixed adenoma of the thyroid gland.

CASE VIII.—(Path. No. 05-95.) Female, aged 21 years, married. A tumor the size of a marble appeared in the region of the right lobe of the thyroid five years ago, two years after her last child was born, and has gradually increased in size since. Dyspnœa has been more marked of late.

Operation, January, 1905, by Dr. Elting. Ether. "The patient took the anæsthetic very badly. Resuscitation was necessary during the operation. The tumor was removed through an incision along the anterior border of the right sternocleidomastoid muscle."

Pathology.—Macroscopic Examination: Specimen consists of an encapsulated tumor measuring 2.5x2x1.5 cm., enclosed in a yellowish white capsule. On section it is fairly firm in consistence and presents a brownish white surface. Very little connective-tissue stroma can be seen.

Microscopic Examination.—Section shows a thick fibrous capsule with normal appearing thyroid tissue in its outer layer. The structure of thyroid gland can be made out, but the individual vesicles are small as a rule and contain no colloid. In a few areas the vesicles are elongated and assume a tortuous tubular shape. The connective tissue shows hyaline degeneration and œdema.

Microscopic Diagnosis.—Pure adenoma of the thyroid.

Etiology.—These adenomata comprise the solid non-malignant encapsulated tumors of the thyroid. They may arise within the tissue of the thyroid gland, without and connected with its capsule, or at some distance from the gland. They occur usually singly but in two instances in my series they occurred as multiple tumors of one lobe. In one of these were present two smaller tumors, each about 3 cm. in diameter, attached to either pole of a larger tumor 8x3x3 cm. in size. In the other a tumor of the left lobe 8x6x3 cm. in size had attached to its capsule at one pole a small nodule about 2 cm. in diameter, which macroscopically had the same appearance as the larger tumor.

As to the location, five occurred within or apparently arose from the right lobe, two from the isthmus, and one from the left lobe, and in one instance the situation was not stated. These tumors are in my experience usually of small size. The largest was 10x8x6 cm. and the smallest 3 cm. The average diameter was about 5 or 6 cm.

Clinically the adenomata are not as a rule difficult to recog-

nize. They are hard and firm, freely movable, and generally present no symptoms except tumor. By their pressure upon the trachea or œsophagus they may produce dyspnœa or dysphagia and in two instances the extreme nervousness of the patient was ascribed to such pressure. The age of onset seems to correspond to that of adenomata in other glands of the body, occurring during youth or early adult life, when glandular activities are at their height. The age of onset was generally between 16 and 35 years; five or over one-half between the twentieth and thirtieth years. From the fact that these tumors produce no subjective symptoms, and that their growth is as a rule slow, it is often many years before the patient seeks surgical relief. It is probable that these tumors are far more common than indicated by this series, for it is only when they produce pressure symptoms or cause considerable disfigurement that the advice of the surgeon is sought.

No important etiologic factors, other than the age, can be determined. In one case, the tumor appeared two weeks after confinement.

There is nothing in the records to indicate that the thyroid gland in these cases was abnormal. Where observations were made by the operator, it is noted that the gland appeared normal.

Pathology.—The adenomata are definitely encapsulated tumors, usually smooth, but occasionally somewhat nodular or lobulated. The tumors vary considerably in consistence but are usually soft.

Two distinct varieties may be recognized, depending upon the type of vesicle. In the first, which we may designate as *pure adenoma*, the growth is found to be composed of closely-packed epithelial vesicles, containing little or no colloid and very small amount of connective tissue. Many of the acini are seen to be filled with epithelial cells. In the other variety, we have a condition in which histologically the picture very closely simulates that of simple hypertrophy. These we may designate as *colloid adenomata*. The epithelial vesicles are dilated and

filled with colloid material. There is usually but a single lining layer of epithelium.

An interesting feature of these tumors is their tendency to undergo various degenerative changes. The colloid adenoma resembles somewhat histologically the simple hypertrophy, but differs, however, in some important respects. Thus the stroma is less abundant, the walls of the vesicles are thinner, and the epithelial cells lining the vesicles in the hypertrophied organ are of a lower type than those in the colloid adenoma. To make a distinction between simple hypertrophy and adenoma is easy clinically and from a macroscopic examination of the specimen but upon histologic examination distinct differences in structure are not so evident.

Briefly stated, the main differences seem to be these:

(a) As to the epithelium lining the vesicles. In the adenoma we find the cell tending to a columnar character, while in the hypertrophy the cells appear more compressed and assume the appearance of a cuboidal type.

(b) As to the contents. Colloid. In the early adenoma, epithelial tissue is the one tissue present. Small amounts of colloid are visible, but this is not seen in appreciable amounts until a later stage. In this later stage the colloid is increased markedly in amount, and approaches as to quantity the amount which is visible in the hypertrophied gland. Besides this colloid material, which in certain amounts is normally present, the alveoli may also contain desquamated epithelium and red-blood cells. In the colloid adenoma there is usually present a large number of epithelial cells within the alveolus, which stands in marked contrast to the hypertrophy where no desquamation is evident. Again in the adenoma small hæmorrhages into the alveoli are more common.

(c) As to stroma. In the adenoma scarcely any connective-tissue stroma is visible, the vesicles with or without colloid material being closely packed together. In the hypertrophy, however, while a number of vesicles containing considerable colloid are in close proximity, being separated by small amounts

of connective tissue, the groups of vesicles are isolated and between these groups dense and rather large amounts of connective tissue are visible.

Depending upon the secretory activity of the epithelial cells of the adenomata, a complex picture may be produced.

First, All of the epithelial cells may begin to secrete actively, and varying amounts of colloid may appear within the alveolus, producing the *colloid adenoma*.

Second, All the epithelial cells may fail to secrete, and then we have a type of gland in which no colloid material is visible, resembling in many respects the type of tumor described as *fatal adenoma* but differing in that the vesicle is not solid,—*i.e.*, made up of several layers of epithelial cells, but is merely an alveolus lined by a single layer of cells in which no colloid material is evident.

Third, A number of the cells may remain dormant while the remainder are secreting colloid material, thus presenting the picture which many authors describe as *mixed adenoma*.

Cyst Formations.—Here I wish to emphasize the fact that undoubtedly a large percentage of cysts of the thyroid have their origin in adenomata. Very frequently we find in the walls of cysts thyroid tissue resembling simple hypertrophy. Cyst formations however in thyroids that have undergone simple hypertrophy is an extremely rare occurrence. None of the cases reported in this series show aught but minute cysts formed by the rupture of the walls of a few adjacent vesicles and the coalescence of their contained colloid. The adenomata, however, appear very prone to undergo degeneration with the formation of cysts. In Case VI it was seen that the tumor presented distinct evidences at its centre of beginning cystic formation.

III.—RECURRENT ADENOMA. THREE CASES—MALE 2, FEMALE 1.

The adenomata, as has been shown in the preceding section, occur singly as a rule and do not present histologically or clinically signs of malignancy. We have, however, three

cases in which there has been either recurrence at the site of operation or a subsequent appearance of a similar tumor in other portions of the gland. These were clinically considered to be malignant, and the microscopic study revealed a more or less atypical growth of epithelium.

CASE IX.—(Path. Nos. 97-3 and 64-19.) Male, aged 49. Thyroid tumor appeared twenty years ago and gradually increased in size up to five years ago, causing dyspnoea and dysphagia.

Operation, February 6, 1897, by Dr. Macdonald. Removal of tumor. Five months later a similar tumor appeared in the isthmus and gradually increased in size for four and a-half years; and now presents as a firm apparently encapsulated tumor in median line of neck about 4x6 cm. in size. The lateral lobes of the thyroid show slight enlargement. The surgeon, Dr. Macdonald, considered the growth to be malignant and the entire gland was therefore removed.

Pathology.—(First operation). Macroscopic Examination: Specimen consists of a portion of the thyroid gland measuring 9x6 cm. The outer surface presents a mottled appearance, the prevailing color being red, with here and there small areas of discoloration due to hæmorrhage. The surface vessels are distended. On section the specimen shows a large empty cyst, the walls of which are thin and covered by gelatinous substance, probably colloid material. Other cysts are seen of smaller size than the one just described. They are filled with a colloid material and in some are small pea-sized hæmorrhages. Portions of the growth have undergone calcareous degeneration.

Microscopic Examination.—No definite capsule is seen. The tumor proper is made up of tissue of the same general type as that of the normal thyroid but which shows greater irregularity in the gland acini. The connective-tissue network is moderately augmented; this is evident in the size of its strands. Irregularly distributed throughout the specimen are collections of epithelial cells of the same appearance as those constituting the normal gland structure. The gland spaces are for the most part smaller than normal, though here and there dilated spaces may be seen. All alveoli contain homogeneous pink-staining material, presumably colloid; in a few hæmorrhage has occurred. There is marked hyperplasia of the epithelial cells.

Microscopic Diagnosis.—Adenomatous cyst of the thyroid.

Second Operation.—(Path. No. 64-19.) Macroscopic Examination: Specimen consists of six pieces of tissue which are evidently from the thyroid gland. The largest portion measures 7x8x4 cm. Its outer surface presents a somewhat lobulated appearance and is covered with a smooth membrane to which are attached a few fibrous adhesions. Beneath the membrane the color of the tissue is a light red. On section the tissue is of fairly firm consistence, but varies somewhat in character in the different portions. In some places it presents a semi-translucent grayish white appearance, in others it is darker in color and somewhat more opaque. Considerable portions of the specimen are made up of colloid material. Here and there are definite calcareous deposits. In one of the smaller portions which measures 7x4x2 cm. the tissue resembles that already described except that an area about 3.5 cm. in diameter is definitely hæmorrhagic. The remaining pieces which compose the specimen are similar in structure to the portions described.

Microscopic Examination.—We have here the same general type of tissue seen in the tumor removed five years previously. Some of the gland acini are greatly enlarged and filled with colloid material; others are small and have only a cellular content. The epithelium approaches the columnar type and in many places shows no typical arrangement.

Microscopic Diagnosis.—Adenoma of thyroid.

In this case the specimen first removed (97-3) is a cyst which has apparently arisen by degeneration of an adenoma, while the second growth (64-19) presenting the same characteristics clinically, was an adenoma. The significance of this in relation to cysts will be discussed under that heading.

CASE X.—(Path. No. 64-26.) Female, aged 45. Tumor of right lobe which first appeared seventeen years ago (1888). After five years it reached the size of a lemon and was removed September, 1893, no pathologic study was made. Four years after first operation (1897) a similar tumor appeared in the left lobe and was removed six years later (Sept. 21, 1903), by Dr. Macdonald. This tumor the patient states seemed exactly similar

to the first one. Both finally produced pressure symptoms upon the trachea and œsophagus, and for relief of these symptoms patient sought operation. With the second tumor there was considerable pain, and dyspnœa and dysphagia were more pronounced. The description of this tumor follows:

Pathology.—Macroscopic Examination: Specimen consists of a portion of thyroid gland measuring approximately 11x4.5x3.5 cm. Beneath the capsule except in a small portion of the end of the tumor can be seen numerous pea to cherry-sized cysts. In the centre of the specimen can be felt a hard stone-like mass the size of a cherry. On section all but a small area at one end of the specimen is seen to be filled with various sized cysts containing a clear colloid material. The wall of one of the larger cysts is completely calcified and measure 2 mm. in thickness.

Microscopic Examination.—The gland alveoli are numerous and for the most part distended by homogeneous colloid material. Some contain also desquamated cells and leucocytes many of which are loaded with pigment. The alveoli surrounding the more distended alveoli are small and arranged concentrically. Other areas show small irregularly developed alveoli. Several are irregular and without any distinct limiting wall and contain a bluish pink mucoid-like material, blood pigment and elongated connective-tissue nuclei. The interalveolar tissue shows hyaline degeneration in places.

Microscopic Diagnosis.—Adenoma with hæmorrhage and calcification and a tendency to an atypical growth of the epithelium.

About two months ago, two years after the second operation, a tumor appeared in median line of the neck and has slowly increased in size. This tumor is clinically an adenoma. There is no evidence of recurrence at the sites of previous operations. Patient's general health is excellent. The patient is considering an operation.

CASE XI.—(Path. No. 97-2.) Male, aged 60. Tumor removed from the region of the right lobe of the thyroid by Dr. Macdonald nine years ago.

Pathology.—Macroscopic Examination: Specimen consists of a mass almost the exact size and shape of a kidney. The surface is irregular and in places it is covered by a distinct capsule

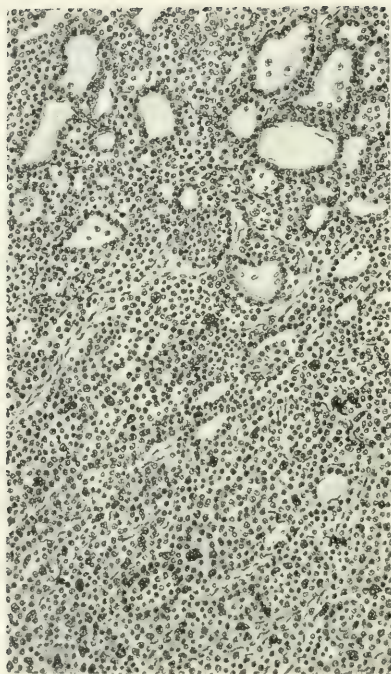


FIG. 2.—Microscopic drawing of a recurrent adenoma, 4 oc. 3 obj. Leitz.

The upper portion of the drawing shows tissue containing a few apparently normal thyroid vesicles. The lower portion shows tissue in which no normal vesicles are present, but composed of epithelial cells, having no typical arrangement, and in a few of which a large, irregular, and deep staining nucleus is seen.

which is somewhat hæmorrhagic. In other places patches of connective tissue containing large blood-vessels lie on the surface. It is somewhat lobulated and of a brownish yellow color. On section at one point is seen a cyst-like cavity containing a friable grumous material of a yellowish color, slightly viscid and apparently cell-detritus. The remainder of the tumor can be divided into a cortical and medullary portion. The cortical portion averages about 1.5 cm. in width and is distinguished from the medullary by its light color and more or less radial striation due to the presence in its substance of fine bands of connective tissue. The medullary substance is distinctly pinker in color than the cortical, and the bands of connective tissue which traverse it have no distinct or regular distribution. The consistence of the tumor as a whole is firm, the cortical substance perhaps being a little firmer. Distinct areas of calcification are present.

Microscopic Examination.—(See Fig. II.) Sections show the tumor to consist of a capsule and tumor substance. The capsule is for the most part made up of fibrous tissue. Here and there, however, it contains small collections of cells of the same type as the gland-cells, and it is evidently formed of compressed gland substance. The tumor itself is composed of a tissue of the same general type as normal thyroid tissue. It differs in the greater irregularity and shape of the gland acini. Near the capsule the connective-tissue network often runs in parallel striæ passing from the capsule into the depths. In the deeper parts of the tumor this cannot be made out. The colloid material in one or two places has undergone calcification.

Microscopic Diagnosis.—Adenoma of the thyroid.

Recurrence in same location after seven years. This second growth was an encapsulated tumor which had reached the size of a hen's egg. Specimen not saved for pathologic study.

A year after the removal of the second growth (April, 1903) there was again a recurrence which soon reached considerable size. On consulting a surgeon at this time the process was considered malignant and operation not advised. From this time until January, 1906, about one and one-half years, when patient was last seen, there has been constant increase in the size of the primary growth, which now measures 7x6 cm. in size. It is located in the right lobe of the thyroid and extends apparently

deep into the neck. Near the upper pole of this tumor there is a second mass, which made its appearance about one year ago. This is entirely distinct from the older tumor, is superficial, and has no deep attachments. It is ovoid in shape, 5x4 cm. in size, and moves about freely underneath skin, which is nowhere adherent over either tumor. Patient has thus far refused operation.

We have then in this case a thyroid tumor which has returned twice after removal, the condition extending in all over a period of nine years, and in which there has developed now in the region of the recurrent tumor a secondary growth. The patient is still in fair general health but suffers from the effects of pressure. The question of carcinoma arises. The long duration would almost exclude this possibility. The growth, while of large size, is as far as can be determined, encapsulated, and affects the health of the patient only by its mechanical presence. Histologically, the first growth removed can be characterized only as an adenoma, though it does present an unusual picture, similar to that in the other two cases described in this group. An interesting feature is that in all of these cases the patients are now over 40 years of age. In one the onset of the first growth was at 51 and in the other two, one at 29 and the other at 32 years of age, thus differing from the usual history of adenoma.

IV.—CYSTS. 12 CASES.

No.	Age of onset.	Age at operation.	Duration.
1.....	10	16	6 yrs.
2.....	21	26	5 "
3.....	..	27	
4.....	17	26	9 "
5.....	38	42	10 "
6.....	33	41	8 "
7.....	36	43	7 "
8.....	15	24	9 "
9.....	25	33	8 "
10.....	19	20	18 mos.
11.....	49	49	4 "
12.....	39	43	4 yrs.

Average age of onset, 27 years and 6 months; average age at operation 32 years and six months; average duration of disease, 6 years; females 7, males 3; sex not stated 2.

We recognize three main types of thyroid cysts, *simple*, *hæmorrhagic*, and *adenomatous cysts*.¹

Simple Cysts. Three cases.

CASE XII.—(Path. No. 06-197.) Male, aged 16 years. When six years of age his parents noticed a small lump about the size of a hickory-nut in the region of the left lobe of the thyroid. This increased very little in size until four years ago, since which time there has been slow but gradual enlargement. There is no exophthalmus or tremor, but the boy is of a nervous disposition.

Operation, January 22, 1905, by Dr. Beilby. Anæsthetic, cocaine. In the region of the left lobe of the thyroid is found a smooth, ovoid tumor about 5x9 cm. with its larger diameter extending from the thyroid cartilage towards the ear. No lobulations can be made out. The tumor is very tense and no definite fluctuation can be determined. It is attached to the larynx and moves up and down perceptibly on swallowing. The cyst was excised without rupture. The thyroid tissue about the cyst appears normal.

Pathology.—Macroscopic Examination: Specimen consists of a cyst of the thyroid gland measuring about 6x9 cm. in size. Its outer surface is smooth and only at one pole can thyroid tissue be seen. On opening the cyst the walls are found to be very thick and fibrous. The contents of the cyst is a brownish translucent fluid with numerous oil-globules floating about in it. The inner surface of the cyst-wall is very white and fibrous and is covered with many flakes of fibrin and some atheromatous patches. One small area of thyroid tissue 1x1.5 cm. projects from the inner wall of the cyst.

Microscopic Examination.—Cyst-wall: outer layer of loose fibrous connective tissue with blood-vessels and a very cellular central zone. At first glance these cells look like lymphoid cells, but the presence here and there of small amounts of colloid material leads to the conclusion that they represent greatly compressed thyroid vesicles with atrophied epithelium. The next

¹In addition to these, occur the small multiple cysts found with great frequency in the simple hypertrophic gland. They never attain any great size and are undoubtedly caused by the coalescence of two or more distended vesicles with fusion of their colloid contents. Clinically, they never produce any symptoms and are only of pathologic interest.

layer is the inner wall of the cyst, which is composed of loose lamellæ of tissue and masses of blood-corpuscles, suggesting an organized blood clot.

Microscopic Diagnosis.—Simple cyst of thyroid.

At present, one year after operation, patient is perfectly well.

This is the type of a thin-walled cyst. They occur in glands that are apparently normal. The cyst-wall is composed of compressed thyroid tissue. The inner wall is usually smooth and fibrous but may be lined with a mass of epithelial cells. The contents is usually fluid but varies both in color and consistence, the color depending on the amount of blood and the consistence on the admixture of colloid.

Hæmorrhagic Cysts. One case.

The following case, illustrating this type, is perhaps almost unique.

CASE XIII.—(Path. No. 195.) Male, aged 41. Eight years ago patient fell backward down stairs. Noticed at once, following the fall, a swelling in the region of the right lobe of the thyroid gland. This increased in size but little until a few days previous to operation, when a rapid enlargement occurred. This was accompanied by a constant dull pain for which the patient sought advice.

Operation, March 16, 1904, by Dr. Elting. Nitrous oxide and ether. Excision of the right lobe of the thyroid. 50 c.c. of brownish fluid was evacuated from the cyst during its removal.

Pathology.—Macroscopic Examination: Specimen consists of an encapsulated mass, evidently comprising the entire right lobe of the thyroid gland. It measures 10x5x4 cm. On section a large cavity is found from which was evacuated 50 c.c. of reddish brown fluid containing necrotic tissue. The necrotic material is both free in the cavity and adherent to the walls of the cyst. Here and there in the walls are found calcified areas, none larger than 5 mm. in diameter. The wall of the cyst averages about 5 or 6 mm. in thickness.

Microscopic Examination.—Sections show the cyst-wall to be composed of thyroid tissue, in general fibrous, but in some areas quite normal. There are areas of hæmorrhage and necrosis. In

these areas and surrounding them is an extensive infiltration with polynuclear leucocytes, though in general the tissue is infiltrated with lymphoid—and plasma-cells. The picture everywhere presented is that of chronic inflammation with tissue degeneration and focal areas of necrosis. The type of thyroid vesicle where it can be made out is that of the normal gland.

Microscopic Diagnosis.—Hæmorrhagic cyst with chronic thyroiditis, hæmorrhage and necrosis.

Hæmorrhage has always been assigned as an important factor in the production of thyroid cysts. The presence of hæmorrhage, recent or old, in cyst contents or its walls is an almost constant observation. It seems probable however that this is much more commonly a secondary process than the true etiologic factor. That a primary hæmorrhage, produced either by violent trauma, or the rupture of a small blood-vessel from any cause within the substance of the thyroid gland, is capable of producing later a cyst there can be no doubt.

Adenomatous Cysts. Ten cases.

That the adenomata play such an important rôle in the production of cysts seems not to have been generally recognized. In this series, 70 per cent., or 10 of the 14 cases, present evidence of having arisen from this type of tumor.

CASE XIV.—(Path. No. 05-010.) Female, aged 26. Tumor of neck nine years, gradual increase in size, more rapid during the last year. Dyspnœa and tachycardia on exertion. Pulse constantly 104-106. Marked harshness of voice. Complains of headache and pain in right ear. Tumor is situated in median line and moves with deglutition.

Operation, July 17, 1905, by Dr. Beilby. Cocaine. Transverse incision. Excision of cyst of isthmus. The remainder of the thyroid gland appeared normal.

Pathology.—Macroscopic Examination: Specimen consists of a thick walled cyst of the thyroid which was removed at operation without rupture. It is nearly globular in shape but slightly flattened in its antero-posterior diameter. It measures 7.5×5.5 cm. Its capsule is of a pink color, very delicate and easily torn. The blood-vessels are large and tortuous. It is rather soft and

fluctuant. On section it is found to contain a brownish bloody fluid. This cavity is approximately 4.5×3 cm. in size. The wall of this cyst measures from 5 to 15 mm. in thickness and seems for the most part to be composed of apparently normal thyroid tissue. There are some areas, however, which resemble glandular hyperplasia. Again other areas show hæmorrhage and necrosis. Blood-vessels are large and numerous.

Microscopic Examination.—Section through cyst-wall shows a thick capsule, which has apparently been formed by compression of thyroid tissue. Scattered throughout are many normal thyroid cells and in some areas are acini filled with colloid material and lined with cuboidal epithelium. From this capsule strands of connective tissue extend to the deeper portion of the cyst wall and form a definite connective-tissue framework, presenting somewhat the histologic structure of thyroid acini. These spaces, however, are packed with what are apparently desquamated epithelial cells. A few normal acini are noticed, which are filled with colloid material. Other sections show in addition free masses of red-blood corpuscles, and marked hyaline degeneration of the connective tissue.

Microscopic Diagnosis.—Cyst in a *mixed adenoma*.

At present, eight months after operation, the patient is in excellent health. The huskiness of her voice has largely disappeared, her pulse rate has dropped ten to twelve beats per minute, and she is not so nervous as before operation.

CASE XV.—(Path. No. 64-23.) Female, aged 26. Has had a tumor in the right side of the neck in the region of the thyroid for five years. Tumor first appeared during first pregnancy. There has been a gradual slow increase in size up to three years ago, when after the birth of her second child the growth became more rapid.

Pathology.—Macroscopic Examination: Specimen consists of a globular cystic mass 5×3.3×2.5 cm., the outer surface of which is smooth and encapsulated. On section the cyst contents are found to consist of a brownish fluid. The cyst wall is smooth. The cyst originates in the thyroid gland, and to its outer surface fragments of normal thyroid-tissue are adherent.

Microscopic Examination.—The capsule is composed apparently of compressed thyroid alveoli. Within the capsule proper

the tissue has the structure of thyroid and very slightly approaches the characteristic foetal type of gland. No colloid is visible.

Microscopic Diagnosis.—Cyst in a pure adenoma.

CASE XVI.—(Path. No. 97-4.) Female, aged 20; has had a tumor in the region of the isthmus of the thyroid for eighteen months.

Operation, October 19, 1897, by Dr. A. Vander Veer.

Pathology.—Macroscopic Examination: Specimen consists of an oval piece of tissue 4.5x3.5x2.5 cm. It is for the most part cystic, the cystic contents having been removed, leaving a cavity which occupies about two-thirds of the tumor, the upper third consisting of a solid mass of tissue. The outer surface of the tumor is moderately smooth, but here and there are the remains of adhesions. The cyst-cavity is the size of a walnut and its walls are thin, averaging about 1 mm. in thickness. The inner surface is very irregular, and is traversed here and there by raised bands. The color varies from pinkish to grayish white. Secondary cysts varying from those the size of a pin-head to those the size of a pea can be made out in the walls. They contain a mucilaginous yellowish brown fluid. In places on the inner surface of the cavity are areas of calcareous deposit. The solid portion of the tumor is only moderately firm in consistency and measures 2x1 cm. Its cut surface is of a yellowish gelatinous appearance. It contains a number of small cysts filled with fluid, which varies in color from a light to a dark brown.

Microscopic Examination.—The tumor on section presents varying appearances. In some places it has the ordinary appearance of thyroid gland structures, being made up of cavities of various sizes, containing colloid material, between which are cellular bands of tissue. This appearance is confined particularly to the portion of the tumor furthest removed from the cyst cavity. The walls of the cyst-cavity are made up, for the most part, of a firm solid tissue, composed of a basement substance containing numerous epithelial and spindle shaped cells. In this substance are to be seen the compressed remains of the thyroid alveoli and also a very large number of cells containing a yellowish brown pigment, evidently changed blood-pigment. At one point are present in the tumor a number of wedge-shaped spaces, the walls of which are formed by the tumor-tissue. In these are occasional spaces

representing a deposit of crystals, presumably cholesterin. The cells about these spaces are multinucleated, apparently foreign-body giant-cells.

Microscopic Diagnosis.—Cyst in a colloid adenoma.

It will be recalled that in discussing the adenomata we recognized two types of thyroid vesicles,—one large and containing colloid, and the other smaller in which no colloid was visible; also a third variety, combining the characteristics of these two. In the walls of these cysts we find a histologic structure which exactly corresponds to one or the other of these types. As we might perhaps expect, the colloid adenoma is the variety which most frequently undergoes cystic degeneration. Five, or one-half, of the cysts in this series were of this type. In only one could no colloid be seen in the tissue of the cyst-wall. Four were of the mixed variety. Aside from the histologic evidence of the production of cysts from solid adenomata, we have in certain of the cases a gross appearance indicating beyond doubt that the tumor was originally an adenoma and that degeneration has taken place with a resulting cyst formation. Of importance in this connection is the observation of cholesterin crystals indicating fatty transformation of the epithelial elements. If the process is an early one the cysts may be only of small size and the structure of the adenoma still be retained.

As the degeneration advances and the fluid contents of the cyst is increased in amount, there is compression of the alveoli and later many of the cells may atrophy and the stroma undergo various forms of degeneration, giving widely varying and very complex pictures. The inner layer of the cyst may then be said to be composed of the remains of the adenomatous tissue, while the wall proper represents the fibrous capsule of the original adenoma, and the outer layer, the stroma and compressed alveoli of the surrounding thyroid-tissue. With the enlargement of the cyst and its encroachment upon the surrounding normal thyroid-tissue we often get a lamellated appearance. These lamella are as the result of the successive

compressions of the normal gland-tissue, with subsequent atrophy of the epithelial structures, leaving only the stroma and alveolar walls. Thus fibrous bands of varying thickness appear. Between these layers are often seen normal thyroid vesicles, and vesicles in various stages of atrophy.

The histogenesis of these cysts may be said to be as follows: In the beginning we have an encapsulated adenoma composed of cells which present no colloid secretion. As the growth continues colloid material is secreted and a coalescence of these colloid vesicles in the centre of the tumor to be seen. Hæmorrhage occurs and we have a cystic cavity filled with bloody colloid material. The fibrous capsule of the original adenoma forms the wall of the newly-formed cyst. As the degenerative process continues and the contents of the cyst increases the tumor necessarily becomes larger and pressure is exerted on the surrounding normal tissue, causing atrophy of apparently normal vesicles. As in long continued degenerative processes occurring in other tissues, lime salts may eventually be deposited in the wall of the cyst giving extensive calcified areas.

V.—ABERRANT OR METASTATIC THYROID TUMORS WHICH
ARE HISTOLOGICALLY BENIGN BUT CLINICALLY
MALIGNANT. ONE CASE.

CASE XVII.—(Path. No. 88-68.) Male, aged 65 years. Family and past history not important. Six months ago first noticed a fulness of right side of face and difficulty in breathing through right nostril. Tumor has increased in size rapidly and has been accompanied by considerable pain. At present there is complete occlusion of the right nostril and bulging of right eyeball with inflammation of conjunctiva, and obstruction of tear duct. At the operation by Dr. Vander Veer the antrum of Highmore was opened but only a small portion of the growth was removed. Its extensive character made a complete removal impossible. The clinical diagnosis was sarcoma of antrum.

Pathology.—Macroscopic Examination: Specimen consists of an irregular mass of tissue removed from the upper jaw. There are one or two pieces of bone, the remainder of the tissue being

of a grayish white color and having the appearance of granulation tissue.

Microscopic Examination.—The sections indicate that the tissue is that of the thyroid. Two definite pictures are presented. First, large alveoli filled with colloid, lined usually by a single layer of cubical epithelium, and containing throughout the colloid substance many desquamated epithelial cells which take the stain rather poorly. Second, areas showing epithelial hyperplasia but less tendency to colloid secretion, giving the tissue a more solid cellular appearance. On careful examination of these cellular areas they are found to be composed of closely packed thyroid vesicles, some of fair size but filled with cells which approach a columnar type. Hæmorrhages into the alveoli are frequent. Connective tissue stroma is very scant. The tissue shows signs of inflammation in places, containing a number of polynuclear leucocytes.

Microscopic Diagnosis.—Aberrant or metastatic thyroid tumor.

For the further history of the case I am indebted to Dr. Merritt, of Cherry Valley, who writes me that the growth increased very rapidly after the patient left the hospital and finally involved the right eye. The bony structures he thinks were extensively involved as some of the teeth and a portion of the superior maxilla were lost during the course of the disease. To the best of the doctor's recollection and that of the patient's friends, there was no hypertrophy or tumor of the thyroid gland, either previous or subsequent to operation.

To establish a positive diagnosis of *metastatic adenoma of the thyroid*, we must necessarily have at least clinical evidence that a primary adenoma existed in the thyroid gland. This evidence is wanting. If such an adenoma existed it was so small as to escape notice. Whether or not such a primary tumor existed the case is of equal interest.

There are now in the literature records of about 20 cases of tumors apparently metastases from the thyroid, which were histologically benign. As in a number of these instances there has been no apparent primary thyroid lesion, these cases have

been considered as *metastases from normal thyroid tissue*. Where a thyroid lesion has been observed it has been that of simple hypertrophy or adenoma, and the metastatic tumor has had a similar histologic structure. These metastases, which may be single or multiple, have occurred most frequently in bone and have often been removed under the supposition that they were primary growths. Aside from the fact that these tumors are probably of metastatic origin they present as a rule no other indication of malignancy. Frequently, however, they have been known to recur after removal and a number of cases have thus resulted fatally. Therefore the important question arises, are not these tumors malignant and should they not always be considered as such by the surgeon?

In the case I report the tumor presented clinically every indication of malignancy. Its invasion of tissue was rapid and death was caused in eight months after its onset. As there never was observed any hypertrophy or tumor of the thyroid gland, we can only assume that if this was a metastatic tumor the metastasis was from normal thyroid tissue. As will be noted, however, in the microscopic study, the growth was histologically a thyroid adenoma and of the type we have described as mixed adenoma.

In the case reported by Oderfeld and Steinhaus¹ the first tumor observed was in the frontal bone. This was removed and histologically found to have the structure of normal thyroid. The patient was again seen after an interval of six months, but no recurrence was evident. After about a year there was a recurrence and also other similar tumors made their appearance, one in the temporal region and one at the sterno-clavicular articulation. Clinically these tumors were considered to be malignant. At the request of the patient the one in the temporal region was removed. This presented a similar structure to the one removed from the forehead one year before. The patient died a few weeks later. Before death a thickening of the under half of the right lobe of the

¹Centralb. f. allg. Path. u. path. Anat., 1903, xiv, 84.

thyroid was noted. A complete autopsy was not permitted, but all visible tumors were removed together with the thyroid gland. Within the substance of the right lobe of the thyroid was found a small nodular thickening 2cm. in diameter, The remainder of the thyroid appeared normal. The tissues were all carefully sectioned and examined, the authors expecting to find carcinomatous degeneration, but the structure throughout the tumor of the thyroid and the other isolated tumors of the head and neck were uniformly the same and as they observe had the exact structure of normal thyroid tissue. They regard the small thyroid nodule as the primary tumor and the tumors of the head and neck as metastases.

Etiology.—The fact that we have in these metastatic tumors structures similar or almost identical to the tissue found in the normal gland lends special interest in the etiology of these tumors. In its consideration several factors may be taken into account.

First, Origin from *misplaced embryonal tissue*. The theory which has been advanced by Conheim in which he regards the etiology of malignant growths as due to misplaced embryonal cells might be applied to tumors of this class.

Second, Origin from *aberrant or accessory thyroid*. Murphy in a recent article² calls special attention to a group of accessory thyroid glands which he frequently finds at the base of the tongue and which he classified as the superior group. He records 39 cases. In only three is there a note upon the histology of the tumor. Two presented the appearance of "normal thyroid," and one of "colloid goitre." In six, or 15 per cent. of the cases there was recurrence after removal but no other signs of malignancy.

Third, *Propagation of bits of thyroid tissue through the circulatory system*. It is a well-known fact that certain tissues, especially young embryonal cartilage, when transplanted into different tissues of the body or when injected into the circulatory apparatus are apparently nourished and in certain

² Jour. of the Amer. Med. Assoc., 1905, xlv, 1854.

instances continue to grow. An apparently analogous condition is true in regard to the thyroid-gland tissue. Portions of this gland have been excised and immediately transplanted into another animal of a foreign species. The tissue not only has remained alive but has apparently continued to produce its normal secretion. Although no proof is at hand, it is possible that these metastatic tumors could result from small particles of thyroid tissues which had found their way into the circulatory apparatus and had been transferred to distant portions of the body. In an organ as vascular as the thyroid such a condition is not inconceivable especially under conditions of trauma.

As is well known metastases from tumors of the thyroid, like those of the prostate, occur most commonly in bony structures.

VI.—EXOPHTHALMIC HYPERTROPHY. SIX CASES. ALL FEMALES.

No.	Age of onset.	Age at operation.	Duration.
1.....	28	29	16 mos.
2.....	25	26	1 yr.
3.....	20	21	1 "
4.....	24	27	3 "
5.....	28	43	15 "
6.....	44	46	2 "

Average age of onset, 28; average age at operation, 32; average duration of disease, 3 years and 10 months.

Result.—In two cases death occurred, one (case No. 3) on the table at the end of operation as a result of the anæsthetic; the other (case No. 2) died seven days after operation, with the symptoms of extreme hyperthyroidization. The remaining four cases have been either entirely cured or greatly benefited by the operation. Case No. 1, four years after operation, is well and all the symptoms have been relieved except slight prominence of the eyes which remains. The portion of the gland that was left at operation is now distinctly palpable.

Case No. 4, one year and two months after operation: the symptoms are all relieved and the patient is able to pursue his work. Before operation exophthalmos, tachycardia and nervousness were marked. Case No. 5 is well ten months after operation. Case No. 6: operation was done but one month ago. The condition of the patient is improved.

CASE XVIII.—(Path. No. 64-25.) Female, married, aged 26. Complains of enlargement of neck, poor sight and some difficulty in breathing. Onset one year ago; first symptom enlargement, followed by exophthalmus. Thyroid gland now presents symmetrical enlargement; exophthalmus very pronounced, marked tremor of hands. Systolic murmur heard over base of heart; not transmitted. Heart not enlarged. Pulse 140.

Operation, June 24, 1903, by Dr. A. Vander Veer. Ether anæsthesia. Both right and left lobes were removed. For three or four days after operation the pulse ranged between 130 and 158, temperature between 100 and 102 F. Delirious at intervals. Death on the seventh day.

Pathology.—The gross description merely contains the statement that the specimen consisted of two masses of glandular tissue, one measuring 8x4x2 cm. and the other 5x4x1.5 cm.

Microscopic Examination.—(See Fig, 3.) Sections 1, 2 and 3 all show the lobulated structure of the thyroid gland. There is an increase in the interlobular connective tissue. The vesicles composing the lobules are very irregular in size and shape. The colloid material in many of the vesicles has been entirely replaced by epithelial cells. Instead of a single layer of epithelium lining the individual vesicles, we see a number of layers, this proliferation of cells often producing invaginations or papillary projections into the cavity of the vesicle. In certain areas this proliferation of cells has advanced to such an extent as to completely fill the vesicle and we have entire lobules presenting a solid cellular structure. The cells are of a high columnar type. There is lymphocytic infiltration in areas.

Microscopic Diagnosis.—Advanced and diffuse exophthalmic hypertrophy.

CASE XIX.—(Path. No. 763.) Female, single, aged 21. Enlargement of thyroid for one year, more marked on right

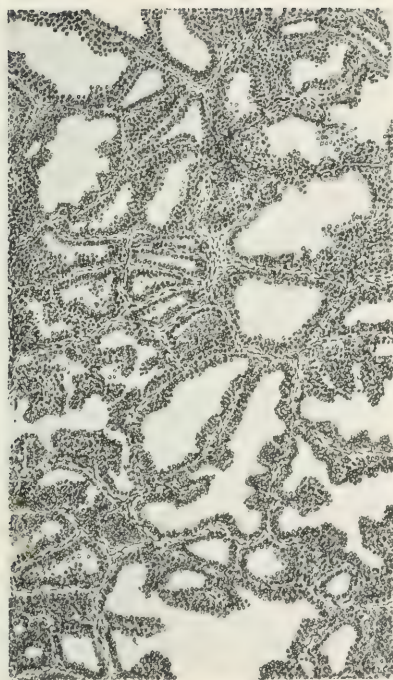


FIG. 3.—Microscopic drawing of an exophthalmic hypertrophy (exophthalmic goitre), 4 oc. 3 obj. Leitz.

In this drawing the hypertrophy is indicated by the proliferation of the epithelial cells lining the vesicles and the papillary projections into their lumen. In places some of the vesicles have been compressed by the hypertrophy of the surrounding epithelium.

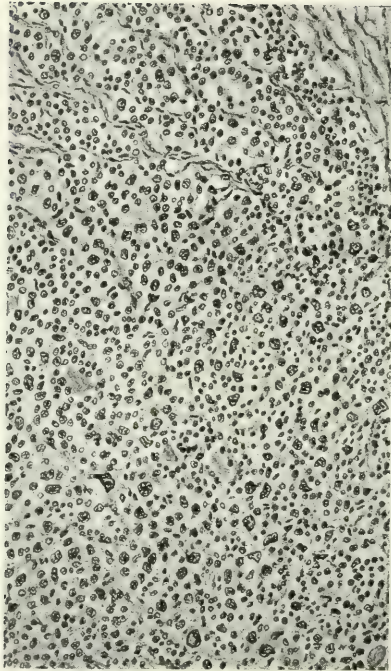


FIG. 4.—Microscopic drawing of a section of thyroid which presents in other areas a definite picture of exophthalmic hypertrophy, 4 oc. 3 obj. Leitz.
(See microscopic description.)

side. Exophthalmus, tremor and tachycardia pronounced. As patient steadily grew worse under medical treatment, operation was advised.

Operation, September 28, 1904, by Dr. Elting. Ether anæsthesia. Excision of right lobe and isthmus. Left lobe not removed. The patient died on the table at the end of operation.

Pathology.—Macroscopic Examination: Specimen consists of two pieces of tissue, measuring respectively 6x4.5x3 cm. and 3x2.5x2 cm. in size. Both are of similar structure. The larger is somewhat lobulated and is encapsulated except on one surface, near the upper pole, where there is a raw granular surface corresponding in diameter to the smaller piece. Both masses are more or less nodular and on section have a pinkish white granular appearance. There are several cysts 0.5 to 1 cm. in diameter containing straw-colored grumous fluid. The surface presents rather round or oval areas, each being somewhat distinct from the other.

Microscopic Examination.—The sections present an unusual picture for exophthalmic hypertrophy. They have in general a definite lobulated glandular appearance. In many lobules the proliferation of epithelial cells has progressed to such an extent as to entirely obliterate the characteristic thyroid gland structure, giving solid epithelial masses. The walls of the individual vesicles have disappeared, evidently as a result of pressure. In one such area (see Fig. 4) there is in addition an unusual change in the cell morphology. As seen in the microscopic drawing, the cells are very large and irregular in shape and in this regard suggest very strongly malignant transformation. In one section, evidently representing the wall of the small cyst mentioned above, the hypertrophy is not so far advanced and hyperplasia of the cells with papillary projection or invagination of the epithelial layers into the cavity of the vesicle is seen, representing more the picture we recognize as that of exophthalmic hypertrophy. The colloid material except in a few places has disappeared. In the study of these sections one is impressed with the possibility of the association of exophthalmic hypertrophy and carcinoma.

CASE XX.—(Path. No. 05-1376.) Female, single, aged 46. For six years headache, extreme nervousness and dizziness at

irregular intervals. Two years ago onset of exophthalmus, tachycardia and tremor. Four months later observed enlargement of thyroid gland. This enlargement is symmetrical and well marked.

Note on physical examination.—Patient is a rather slightly built woman, rather poorly nourished and anæmic. Areas of discoloration of skin on left cheek and backs of both hands. Exophthalmus definite but not of an extreme degree. Sight has failed rapidly. Pulse regular, of even tension, 96 per minute. On admission to hospital it is recorded as 90. Thyroid gland shows a nearly symmetrical enlargement, left lobe a little larger than the right, measuring about 8.5x5 cm. and is moderately firm.

Operation, December 29, 1905, by Dr. Elting. Ether; excision of left lobe and isthmus.

Pathology.—Macroscopic Examination: Specimen consists of what is apparently the left lobe and a portion of the isthmus of the thyroid gland, which have been removed in one piece. The outer surface has a pinkish-yellow mottled appearance. It is covered by a rather delicate fibrous capsule, which has been torn in places and adheres by firm hair-like adhesions. The surface has a distinct lobulated appearance, the lobules varying in size from 0.5 to 2 cm. Several minute cysts 1 to 2 mm. in diameter are seen upon the surface. The tissue has a rather firm feel, and is very nodular. Section has been made through one area where near the surface a cyst has been opened. This cyst is 1.5 cm. in diameter and contains some thick, viscid, translucent material. On section the cut surface presents a reddish-yellow mottled appearance. Lobulations are definitely seen. These vary in size from 1 mm. to 1 cm. and are of widely different shape. The connective-tissue surrounding the lobules can be seen as distinct white bands. It seems more abundant near the centre and in the posterior part. Within the lobules can be seen minute translucent areas, which presumably are thyroid vesicles filled with colloid. The entire lobe as far as determined by section has this appearance. In the isthmus are areas of a more distinct red appearance. The lobules are firm and definite translucent areas cannot be seen. The appearance here approaches more nearly that of normal thyroid tissue.

Microscopic Examination.—A series of sections show two

definite processes. There is seen to be in the majority of the sections a marked increase in the size of the alveoli and in the amount of colloid present. In certain lobules this is much more pronounced, and suggests a simple hypertrophy, differing perhaps only in the tendency of the cells to assume a higher type in many of these large colloid alveoli. In other areas there is cellular proliferation with diminution or disappearance of the colloid material. The increase in the number of epithelial cells is very great while their approach to the columnar type is not so marked. An alveolar arrangement is frequently difficult to make out. Section through the wall of the small cyst, noted above, shows it to be in the centre of a minute encapsulated adenoma. The connective tissue of the gland is moderately increased in amount and there is considerable lymphocytic infiltration in areas.

It seems, then, that we may recognize two forms of exophthalmic hypertrophy; in the one form the disease begins in an apparently normal gland and the process is symmetrical, so that histologically we find everywhere the type of lesion so well illustrated in Fig. 3. Clinically in this form we recognize as a rule a very symmetrical enlargement of the gland, though one which never attains great size. The disease is of comparatively short duration, patients dying as a rule in from one to three years if untreated. The well known symptom-complex of the disease,—enlargement of the gland with exophthalmus, tachycardia and tremor,—is invariably present. In the other form the exophthalmic process is secondary or associated with some other type of thyroid affection. In three, or one-half, the cases in this series an associated simple colloid hypertrophy was found. The cases in this series illustrating this type are Nos. 4, 5 and 6.

This form is characterized clinically by a longer duration, by a greater increase in the size of the gland, and by lesser severity of the symptoms. These cases, however, all had exophthalmus, tachycardia and nervousness of greater or lesser severity. In Case V, while the enlargement of the gland was of 15 years duration, the symptoms of exophthalmic goitre had

developed more recently. In the other two cases these symptoms were present from the onset.

The histologic picture also differs. Instead of a uniform process, as in the former group, we see the exophthalmic hypertrophy only in foci or in various lobules scattered throughout the gland. In the cases where this hypertrophy is observed it is of a lesser degree. Other investigators have also recently called attention to the fact that exophthalmic hypertrophy is frequently associated with various pathologic conditions of the thyroid, as cysts, adenomata and carcinomata, and that these may be the unproduced atypical exophthalmic goitre symptoms. Usually there is present the nervousness, tachycardia and tremor of varying degree while the symptoms of exophthalmus may be wanting.

In typical cases of exophthalmic goitre, which present the well-known symptom-complex, all writers agree that the histologic changes found in the gland are definite and constant. They have been characterized as a true hypertrophy. They very closely resemble the compensatory hypertrophy which is seen in the remaining portion of the thyroid gland after its partial excision, and which in this manner has been so frequently produced experimentally in dogs. Briefly the changes are (1) a change of the epithelium from a low or cuboidal type to a high cylindrical form, (2) a gradual disappearance of the colloid material which seems to be one of the earliest evidences of beginning hypertrophy, (3) alteration in the size and form of the alveoli due to the hyperplasia and infolding of the epithelium, (4) increase in the vascular supply and in the connective tissue stroma.

As we have noted however in cases in which the symptoms are atypical no such definite changes are observed. We may see only in foci evidences of this process. It may amount simply to a change in the size and form of the cell, and perhaps instead of a single layer of epithelium lining the alveolus there may be two or more. There may be said to be, however, in all cases evidence of proliferation of cells with increased

activity. Whether or not we shall be eventually forced to the conclusion that all the various affections of the thyroid gland characterized by cellular proliferation give rise to the symptoms, more or less complete, of Graves' disease is a matter which requires further study.

As to the pathogenesis of this affection nothing can be said to have been as yet definitely established. The main dispute is still whether the disease is of nervous origin or has its basis in an abnormal condition of the gland itself. The majority accept the latter view, and hold that the disease is a manifestation of an excessive or perverted secretion of the thyroid epithelium. This seems the most rational supposition and it is borne out by certain facts,—viz., the similarity in the histology of the compensatory hypertrophy and the exophthalmic variety; the relationship between the advancement of the hypertrophy and the duration and severity of the clinical symptoms; and the beneficial effects that are produced by removal of a portion of the hypertrophied gland. What relation if any the parathyroids have to exophthalmic goitre has not been determined. In none of these cases were these bodies examined. The changes that have been described are not at all constant.

In regard to the age of onset, the cases of this series correspond closely with those of other observers. By far the greatest number appear between the ages of 20 and 30, five out of six cases are recorded above. In one case, however, the age of onset was stated as 44. An onset before puberty or after 40 is rare. The disease is much more common in females than males, the proportion as variously stated ranging from 3 to 1 to 17 to 1.

VII.—CHRONIC THYROIDITIS. ONE CASE.

CASE XXI.—(Autopsy No. 0-283.) Autopsy April 18, 1900, by Dr. Blumer. Female, aged 40. No clinical history.

Anatomical Diagnosis.—Sclerodema with pigmentation of the skin affecting the face, posterior part of the trunk and extremities. Acute sero-fibrinous pericarditis, with acute myocarditis and diffuse interstitial myocarditis. Double hydrothorax with acute

fibrinous pleurisy on the left side. Acute bronchitis with emphysema of the lungs and atelectasis of the lower lobes. Chronic passive congestion of the liver. Acute infectious nephritis. Chronic interstitial thyroiditis. Chronic interstitial mastitis. Tuberculosis of a bronchial lymph-gland. Small ulcers over the internal condyles of the humeri.

Pathology.—Macroscopic Examination: The thyroid gland is small, firmer and somewhat grayer in color than normal. It contains apparently an increased amount of connective tissue.

Microscopic Examination.—Marked changes in the gland are seen. These take the form of a great increase in the interstitial tissue of the organ, producing compression and atrophy of the glandular substance. The new-formed connective tissue is mostly in the form of a dense, fully-formed fibrous tissue, but there are areas in which the thyroid tissue is infiltrated with small, round, lymphoid cells, apparently representing a recent infiltration. There is an increase in the elastic tissue. The gland substance shows varying degrees of compression. In some places it has almost entirely disappeared over quite wide areas; in other places it is apparently but little affected. There is an abundance of colloid material in the slightly affected areas. *Microscopic Diagnosis.*—Chronic interstitial thyroiditis.

This case is not introduced into this series to raise the question of the relation of the thyroid to the condition of scleroderma, but as a typical illustration of the pathologic changes produced in the gland by a chronic inflammatory process. Acute inflammation of the thyroid gland frequently occurs following acute general infections, as typhoid and the exanthemata. The chronic form is very often associated with other thyroid affections, the hypertrophies, cysts and tumors, and they present in varying degrees the condition here described.

VIII.—TUBERCULOSIS. TWO CASES—ONE MALE, ONE FEMALE.

No.	Age of onset.	Age at operation.	Duration.
1.....	40	42	2 yrs
2.....	35	43	8 "

In the first case the previous health of the patient was said to have been good, but death from pulmonary tuberculosis occurred six years after the operation. In the second case the history at about the time of the onset of the thyroid involvement suggested pulmonary tuberculosis. The patient now (two years after operation) is in good health and presents no evidences of active tuberculous disease in any organ.

CASE XXII.—(Path. No. 64-2.) This case I am able to report as tuberculosis of the thyroid only upon clinical evidence, as although the microscopic sections show tuberculous granulation tissue no thyroid structure can be made out. The patient was a male, aged 42. The disease began two years before with a small "lump" in the region of the thyroid gland which gradually increased to the size of a walnut, suppurated and discharged spontaneously, leaving two small sinuses which have persisted for a year. At the operation by Dr. Macdonald the sinus tracts were found to lead down to the thyroid gland and they were excised together with the gland in one mass. Clinically, as recently related to me by the operator the process had its origin in the thyroid gland.

Pathology.—Macroscopic Examination: The specimen consists of a piece of tissue about one-half the size of a hen's egg. It contains some tissue which is presumably thyroid gland, and leading into it from the surface of the specimen are two sinus tracts, the walls of which are extremely ragged and lined with yellowish purulent material. *Bacteriologic examination* fails to show tubercle bacilli.

Microscopic Examination.—No thyroid tissue is to be seen. The section consists of connective tissue and of large areas of caseation. Surrounding these areas of caseation is typical tuberculous granulation-tissue, made up of epithelioid and lymphoid cells, and containing an occasional giant cell.

CASE XXIII.—(Path. No. 64-21. History taken and physical examination made December, 1905, two years after operation.) Female, aged 45. When 14 years of age parents thought she had consumption but, if so, she recovered completely. She married at 21 and now has 7 children, all in good health. At birth of last child, 11 years ago, she had puerperal fever and was seven months in bed. After this had a severe cough, night sweats and con-

siderable expectoration. During this illness her physician first noticed a small tumor in the median line of the neck in the region of the thyroid gland which gradually increased till 2 years ago, when it reached the size of a hen's egg. It was tender on pressure and sometimes painful and caused some dyspnoea during the last year before operation. It never showed redness or signs of inflammation. The patient entered hospital at this time for an operation for uterine myomata and she was persuaded by the surgeon to allow removal of this enlarged portion of thyroid.

Operation, November 5, 1903, by Dr. A. Vander Veer.

Pathology.—Macroscopic Examination: Specimen consists of an irregular mass of reddish brown tissue 6x4x2.5 cm., in which lies a sausage-like mass. This latter on section is found to be of a uniform consistency and of moderate firmness. Color is slate brown and deviating striæ give to the cut surface a lobulated appearance.

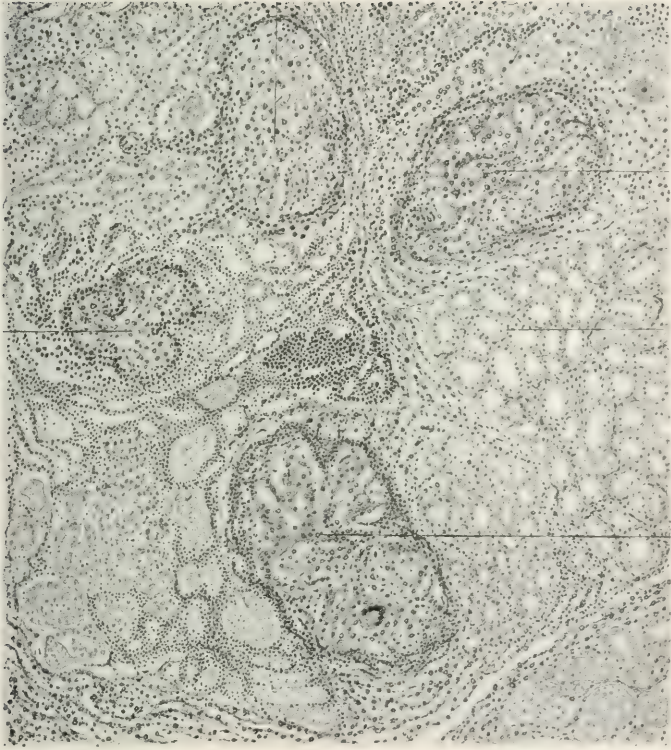
Microscopic Examination.—(See Fig. 5.) The thyroid tissue shows marked proliferation of alveoli, the majority of which are massed together, making the outlines of individual alveoli indistinct, while others contain a moderate amount of colloid material. In many of the lobules are circumscribed masses of epithelioid cells with occasional giant cells and a peripheral ring of lymphocytic infiltration. But a few of the tubercles show early caseation.

Microscopic Diagnosis.—Tuberculosis of the thyroid gland.

The patient was seen in December, 1905, 2 years after operation and this note on her present condition was made: "Patient is fairly well nourished, but slightly anæmic. There is a linear scar in the median line of neck 7.5 cm. in length, extending from a little beneath the chin to the episternal notch. Aside from a little thickening and redness at its lower end the scar appears healthy. There is no apparent enlargement of any portion of the thyroid gland. Patient has no cough and states that she is in good health and able to pursue her work. Examination of the lungs reveals no evidence of disease, though the breath sounds at both apices and considerably subdued. There is no glandular enlargement anywhere."

While it is true that tuberculosis of the thyroid gland is a rare disease, from recent studies it has been demonstrated that it is not so rare as was formerly supposed. Thus P.

a



a

b

a

FIG. 5.—Microscopic drawing of tuberculosis of the thyroid gland, 4 oc. 3 obj. Leitz.
 (a) Tubercles, in the lower one of which is seen a giant cell. In the centre of the drawing, between the tubercles, is an area of lymphocytic infiltration. (b) Normal thyroid tissue.

Bruns³ in his report of 100 post-mortem examinations made by Chiari of persons who had suffered from tuberculosis, states that the thyroid gland was involved in seven. Of these cases 96 had suffered from chronic pulmonary tuberculosis, and in only four of these was the thyroid gland involved; the other four were cases of acute miliary tuberculosis, and in three of these the gland showed involvement. Weigert in fifty cases of chronic pulmonary tuberculosis found tuberculosis of the thyroid in six. Two forms of involvement are recognized; a miliary form secondary to a general miliary tuberculosis, and a nodular form affecting the gland diffusely. The former is the more common. It does not produce any enlargement of the organ as a rule. Of the nodular form Bruns was able to collect six cases besides his own; in three of these from a clinical point of view the thyroid lesions were primary. This form is attended by enlargement of the organ sometimes sufficient to produce pressure symptoms. As illustrated in Fig. V, these tubercles have the ordinary characteristics of tubercles in other organs. They probably always arise in the interstitial connective tissue separating the vesicles.

In the first case here recorded the data is so incomplete that no definite conclusions can be drawn. The clinical history states that the patient's previous health had been excellent, but there is no record of a physical examination to exclude a possible pulmonary involvement. Then the fact that he is said to have died 4 years later of pulmonary tuberculosis leaves us in doubt as to whether the disease was primary in the thyroid with secondary involvement of the lungs or *vice versa*.

W. B. Stanton⁴ has recently made the important observation that in a comparatively large number of cases of pulmonary tuberculosis there were symptoms more or less complete of exophthalmic goitre and in these cases he has been led to examine the thyroid glands. The report is only a preliminary one and no cases in which he has observed these symptoms have

³ Beiträge zur klin. Chir., 1897, xi.

⁴ American Medicine, 1905, x, 605.

died. He could not therefore give the results of histologic examination. Clinically there was slight thyroid enlargement. He records 26 cases of pulmonary tuberculosis aside from the above in which the thyroids were examined post-mortem, but in which the patients were not examined clinically for those signs. In these, tubercles were found in four. As serial sections were not made he thinks it probable that the proportion found to contain tubercles is much too small. Further investigation of this point might yield information of great value.

IX.—CARCINOMA. ONE CASE.

CASE XXIV.—(Path. No. 98-43.) Female, aged 36, with history of illness for last three years. Prominent symptoms are enlargement of thyroid gland, with pain and anæmia. The patient was operated upon two years ago for thyroid enlargement, but no pathologic study of this specimen was made.

Second operation by Dr. A. Vander Veer, February 18, 1899.

Pathology.—Macroscopic Examination: Specimen consists of six masses of tissue, all roughly lobulated and varying in size from 6 to 3 cm. in greatest diameter. They all present similar appearances and are not distinctly encapsulated, though portions of capsule are here and there evident. Where a capsule is present it is generally smooth and of a yellowish-red color. The portions of the growth which are uncovered by capsule are finely lobulated, of a light yellowish-brown color, and have a translucent appearance. This appearance suggests, in some places, the appearance of thyroid-gland tissue; in other places it has a myxomatous character. On section the nodules differ in appearance; the smaller and presumably the younger ones have an almost homogeneous yellowish-gray cut surface, which is covered by sticky mucilaginous fluid which has the glistening appearance of mucoid tissue. In one or two of the smaller masses are areas of hæmorrhage. In one rather large area of light reddish-brown tissue which does not look like hæmorrhage, there is an area homogeneous in character and slightly granular. In two of the largest nodules near the centre are areas of necrosis and calcification.

Microscopic Examination.—Sections from two different portions show an adenomatous tissue divided into irregular lobules by

rather dense fibrous connective-tissue septa, which extend inward from a capsule which is present at one side. Except in a few small lobules near the periphery, where characteristic colloid-containing vesicles are seen, the tissue could not be recognized as thyroid-gland tissue. It is composed of papillomatous-like projections and long epithelial tubules with cavities of thyroid-gland spaces. This arrangement becomes complex and branching as the process develops, until they finally fill up the cavities, producing a gland-like appearance. The epithelium rests upon no visible basement-membrane; the stroma is very scanty. In the connective-tissue septa are many solid epithelial clumps which probably represent new foci of growth.

A section from the homogeneous mass differs only in that no connective-tissue septa are seen, and the spaces are more closely packed with epithelial cells. This section also shows acute inflammation. The epithelial cell is of a high cylindrical type, varying greatly in size and shape.

Microscopic Diagnosis.—Adeno-carcinoma of thyroid gland.

From one observation of carcinoma of the thyroid no important deductions can be made except to call attention to its relative infrequency. One case in 61 thyroid affections, as indicated by this series is, however, undoubtedly too low a proportion and not borne out by the statistics from other sources. Bloodgood⁵ in exactly twice the number of cases records seven of carcinoma. The most elaborate study of this condition that has appeared is by Ehrhardt,⁶ who has collected 150 cases of carcinoma. Sixty-five of these occurred in men and eighty-five in women; 111 appeared between the ages of thirty and sixty. In over 50 per cent. of these cases it was definitely stated that a simple goitre preceded the development of the carcinoma, and in only a comparatively small number that it arose in a normal thyroid. This is the reverse of the condition seen in this country, probably due to the fact that we have no "goitreous districts," Ehrhardt recognizes three main varieties,—the medullary, which is the most fre-

⁵ Surgery, Gynecology and Obstetrics, 1905, i, 113.

⁶ Beiträge zur klin. Chir., 1902, xxxv, 343.

quent, the adeno-carcinoma, and the scirrhus. The latter is, in his experience, rare. Metastases occur early as a rule. In nine-four bodies examined metastases were found in all but fourteen. In forty-six cases twenty-three had metastasized by the blood-stream alone, nine by the lymphatics alone, and fourteen by both these channels. As to the location of metastases, the lungs and bones are the most frequent seats. The bones of the skull and inferior maxilla are most commonly involved, though the sternum and long-pipe bones do not escape.

The average duration is about 2 years, the scirrhus form being the most chronic.

Clinical Diagnosis of Thyroid Affections.—When we bear in mind that the symmetrical enlargement of the thyroid gland indicates a hypertrophy, and the asymmetrical a tumor or a cyst, we have gone a great way towards making a diagnosis. To characterize all of the enlargements of the thyroid as “goitre” is obviously improper, as it conveys no intelligent clinical or pathologic meaning. If this term is used, it should apply to the hypertrophies, and we can then properly speak of the simple goitre and the exophthalmic goitre. To differentiate these latter conditions clinically is not difficult, for in exophthalmic goitre the subjective symptoms are definite and constant. In the simple form the rule is a much greater increase in the size of the gland but no symptoms except those produced locally by pressure. The age of onset and the duration of the disease are also important aids in diagnosis, as has been shown in the preceding tables. In the simple hypertrophy the age of onset in a large proportion of cases is before twenty. In an accurately recorded history I believe it would be exceptional to establish an onset after twenty-five. In the exophthalmic variety an onset before twenty is extremely rare; the majority of cases appear between the ages of twenty and thirty. The duration of the disease in the simple form is much longer, often twenty or thirty years, while that of the exophthalmic hypertrophy is usually less than two years. Where these two conditions are associated, or where the exophthalmic hypertrophy appears secondary to other thyroid

affections, greater variation in these respects is seen. We must bear in mind that in either form of hypertrophy the process in one lobe may have advanced further than in the other, producing an asymmetrical enlargement, but on the other hand no part of the gland appears normal. In other words the process is a diffuse but not always an uniform one. Again, we have seen in certain cases a fairly symmetrical enlargement produced by an adenoma or cyst in either lateral lobe. These multiple tumors are comparatively rare, however, and on close examination present distinctive features. Of the tumors, the cysts and the adenomata are the most frequent, and they are often very difficult to differentiate. They both present the features of encapsulated tumors. The cysts are more apt to be smooth and ovoid in shape, while definite lobulations can often be made out in the adenomata. Variation in the size of the tumor seems to be frequent in the case of cysts. In regard to the recurrent adenomata, two of our observations at least would point to their being of a mild type of malignancy. Considering the long duration, however, and the fact that no metastases occurred, they do not present the features of carcinoma of the thyroid. In one case a secondary growth appeared in the region of the primary one.

From the fact that metastases of the thyroid tissue occurs in cases in which no primary tumors of the gland has been noted, bone tumors looked upon as primary should be approached with this possibility in mind.

Early diagnosis of the carcinomata presents the greatest difficulties and obviously is of the greatest importance. Age here is to be considered as indicated by the statistics of Ehrhardt. The disease is usually of short duration, a few months to one or two years. As met with in this country, carcinoma of the thyroid does not produce a large tumor, but it rapidly infiltrates the gland and surrounding tissue and dyspnoea and dysphagia are early symptoms and out of proportion to the size of the growth. Change in the voice is also an early observation (Bloodgood). In districts where simple hypertrophy is

endemic a very large proportion of the cases of carcinoma, as recorded by Ehrhardt, are secondary to this condition. Here the important feature is a sudden increase in size in the hypertrophied organ, with the return of symptoms after a quiescence of perhaps many years. Primary sarcoma of the thyroid is a rare affection and as no cases were observed in our series the condition will not be discussed.*

Treatment.—As the symptoms in the uncomplicated cases of simple hypertrophy and benign tumors are of a mechanical nature, the severity of these symptoms has been our guide in treatment. Rarely is operation undertaken for the relief of the deformity alone. I believe, however, that since so large a number of these cases undergo secondary changes in later life, making operation imperative, that they should be considered upon the same basis as similar lesions in other organs. In the case of the tumors and cysts an early operation is advocated. With the simple hypertrophy, if the patient has passed young adult life, the period when we might expect a subsidence of the process, and the gland continues to enlarge, a portion of it should be removed. If after a quiescent period new growth is observed, operation may be necessary for the relief of urgent pressure symptoms, and here, too, carcinoma must be considered. Scarcely fifty years have passed since Dieffenbach considered thyroidectomy a rash undertaking. To Kocher more than anyone else is due the credit of the advances in this field of surgery. At the German Surgical Congress, in 1900⁷, he reported the results of his second thousand cases of thyroidectomy, of which 929 were upon cases of simple hypertrophy and benign tumor. He had only four deaths, giving a mortality of 0.4 of 1 per cent. The greatest single factor contributing to this low mortality-rate was undoubtedly the substitution of local for general anæsthesia.

The general principles which guide us in the treatment of

* For report of cases and statistics see Lartigau (Amer. Jour. Med. Sciences, 1901, cxxii, 156).

⁷ Archiv. für klin. Chir., 1900, lxiv, 454.

carcinoma of other organs should apply here, remembering that metastases occur early. Operation to effect a cure must be undertaken before there is extensive invasion of the surrounding tissues.

In the treatment of exophthalmic goitre the various drugs and methods employed are almost innumerable. The weight of opinion now seems to favor partial thyroidectomy, and I believe justly so, for with the accumulating statistics the percentage of cures is increasing and the number of primary deaths decreasing. No other form of treatment has offered so much hope. The observations in this series have been made entirely on the operative treatment, but to give an opportunity for comparison I may be allowed to quote from a review of the literature made recently by the writer,⁸ in which the results of some of the other more recent methods of treatment are recorded. "In late years attempts have been made in many German clinics to develop a specific treatment of exophthalmic goitre." Lanz,⁹ as early as 1894, began the use of the milk of thyroidectomized goats in patients with Graves's disease. He has recently recorded favorable results in five cases. Burghart and Blumenthal¹⁰ in Leyden's clinic have injected the blood-serum of amyxo-œdematous patients into those suffering from exophthalmic goitre. Leyden reviews their results and thinks they are encouraging. Later, in this clinic, was introduced the use of a precipitate from the milk of thyroidectomized goats, called "rodagin." A few cases are recorded of slight improvement after continued use of this substance. Kollaritis reports no improvement in three cases in which he employed this method.

Moebius and Schultes¹¹ have used the serum of thyroidectomized sheep. This serum is called *antithyroidin*. Moebius reports three cases somewhat improved by this treatment and

⁸ Albany Med. Annals, 1906, xxvii, 111.

⁹ Münch. Med. Wochenschr., 1903, I, 146.

¹⁰ Deutsche med. Wochenschr., 1899, xxv, 627.

¹¹ Münch. med. Wochenschr., 1901, xviii, 1873.

later two other cases which were benefited. Schultes and Rosenfield have likewise each reported a case. In a recent communication Moebius¹² speaks rather guardedly of the employment of this serum. Kuh,¹³ after treating eleven cases with the serum, is unwilling to make any statement as to its curative effect. He thinks it relieved nervousness and diminished tachycardia.

In regard to the operative treatment, in four of our six cases the partial excision of the thyroid gland has been attended with excellent results. In two of these all the symptoms have been relieved; in one the operation was of too recent date to determine the ultimate result, but the symptoms one month after operations improved in all respects; in the other all the symptoms except exophthalmus had disappeared, and the patient is able to pursue her work. The time now intervening since operation varies from one month to four years, as shown in the table. Of the two deaths one could be ascribed to the anæsthetic, and the other, in which death took place on the eighth day with the symptoms of extreme hyperthyroidization, as a late case probably beyond possible recovery. It should be borne in mind that the operative treatment, to be of the most value, should be undertaken early, before damage has been done to the nervous system. In this condition even more than in other forms of thyroid affections, the importance of local anæsthesia cannot be too highly estimated. As further proof of the superiority of the operative treatment, the statistics of a number of observers are quoted. The best results of partial thyroidectomy yet published are those of Kocher—59 cases: 75 per cent. cured; 17 per cent. improved; 6.7 per cent. dead.

At the last German Surgical Congress, April, 1905, Friedheim from the clinic of Kümmel reported the results of twenty cases of partial thyroidectomy after five or more years had

¹² Münch. med. Wochenschr., 1903, 1, 146.

¹³ Medicine, 1905, xi, 672.

elapsed. Fourteen were cured, two much improved, three slightly improved, and one had died. In seven of the cured cases the operation had been performed nine or more years previous; in one, fifteen and a-half years. He further presents the statistics of the other large German clinics for the last years as follows:

	Cases.	Cured.	Improved.	Dead.
Von Mikulicz	18	10	7	1
Krönlein	24	16	6	2
Kocher	59	45	10	4
König	8	4	..	1

BRANCHIAL FISTULA.¹

BY MARTIN JOSEPH CHEVERS,

OF MANCHESTER, ENGLAND.

THE arrested development theory as to the formation of branchial fistula is based on the facts that during the preliminary stages of development of the embryonic face, ear channels, and alimentary tract, a series of arches and clefts are formed, the clefts being first formed, the arches being merely the thickening of the sides of the clefts. There are two sets,—those placed in front of the mouth to be, and those placed behind the structure. We are now only concerned with the postoral or visceral arches and clefts, five of the former and four of the latter; and of these in speaking of branchial fistula, we need only consider the true branchial arches and clefts. The true branchial arches are the third, fourth and fifth, and the true clefts are the second, third and fourth. A portion of each cleft is used up in the process of development; failure of the complete closure of the remaining portion of either of these clefts, most commonly the third¹ possibly the fourth,² results in a fistulous tract called a branchial fistula. Frequently this does not make itself evident until some time after birth. Such a fistula traverses the tissues of the neck communicating with the pharynx and sooner or later discharges externally. The present day teaching, as to the treatment of a branchial fistula, is to dissect it out thoroughly, and the success of such a proceeding is doubtful; many advise it to be left alone; others say that it is impossible to close the whole track, and by trying to do so the result would likely be closure of the orifice and formation of a cyst. These facts have prompted me to report a case of this congenital abnormality which I have recently successfully treated by croton oil and galvanism, a treatment

¹ Read before the Manchester Medical Society on March 7, 1906.

which I think warrants further trial, for the result of the treatment in this case has been a permanent cure.

On March 16, 1905, a woman, 22 years old, presented herself and examination revealed a fistula extending from the clavicular origin of the sterno-mastoid, at which point it was discharging, to the level of the upper border of the hyoid bone. There was no tumor, hard or soft, either in connection with the fistula or anywhere in the neck. During the treatment it was discovered that there was at least one communication with the pharynx. There was no history to be obtained, except the fact that it had been discharging since she was a child, and that the amount of discharge had increased considerably for the past two or three years. An ordinary probe passed comfortably, and without any pain, into the opening immediately over the origin of the sterno-mastoid, and upwards for $3\frac{1}{4}$ inches, ending, as it seemed, just above the hyoid bone. On extraction of the probe there followed a slight discharge of sero-purulent or sebaceous fluid, but no trace of blood.

Next day I injected through a very small gum-elastic urethral catheter, which was first passed into the fistulous tract, a 1-in-40 phenol solution, and washed the sinus out. Some of the solution entered the pharynx and was spat out. The day following I again syringed it out, and passed and left in place a silkworm-gut drain. On the third day, after having syringed it out, I twisted together and passed four lengths of No. 2 silkworm-gut, having first dipped them in croton oil. I passed them to what I believed to be the upper extremity of the fistula, my object being, of course, to try and destroy the lining mucous-membrane, and in which, it seemed, I to some extent succeeded, judging from the copious discharge of pus there was on the dressings the following day. After two more days of antiseptic syringing and draining I passed to the upper extremity of the fistula a silver-wire electrode bent on itself, the blunt bent extremity being passed into the fistula and the two sharp ends of the other extremity fitted into a handle which was connected with the cathode wire. The current was gradually increased from zero up to 5 milliamperes, and then gradually reduced to zero again. The anode was then made the active electrode on the inside of

the fistula and gradually increased from zero up to 10 milliamperes and reduced slowly to zero again. No drainage was provided for. The next day, and every day for a week, I applied a flat flexible tin electrode to the skin surface immediately over the sinus only. At each application I first made the cathode the active electrode, increasing the strength of the current from zero to from 15 to 20 milliamperes for a few minutes, and then reducing again to zero, after which I made the anode the active electrode in the same way, but reaching from 30 to 35 milliamperes. Before adopting the application of the alternating currents to the external surface of the fistula, there was a discharge from the exit on applying pressure over the course of the fistula, but after four or five days of the external treatment this discharge disappeared, and at the end of the week's application the watery external discharge, produced on application of the cathode as the active electrode, ceased *externally*, but on such application, and at intervals during the day, the patient complained of a bitter fluid discharging into her throat. The applications were continued for another week, up to April 13, with continued good effect. During the two days previous to April 13 the patient only felt the bitter discharge into the mouth once, and that very slightly. The applications were therefore discontinued on that date.

I need not remind you that the cathode, which attracts hydrogen and alkalies, causes, through its irritative and stimulating effect, congestion, softens and liquefies the tissues, causing a watery discharge; and on application of the anode, oxygen and acids are attracted, which have a tonic and astringent effect, harden and dry up the tissues, and cause contraction of the passage, so that if this electrode is left in too long it may be impossible to withdraw it without damaging the adjacent parts.

It has been shown³ that the therapeutic results and chemical changes brought about by a single five minutes séance with a current strength of from one to two milliamperes so alters muscle-structure that evidences of it can be seen for several days after. It seems probable that the interpolar chemical changes set up have caused the cure of this case, possibly assisted by the use of a silver electrode. But I don't think that very much therapeutic effect could be attained from the use of a silver

electrode which ionizes with difficulty as compared to metals such as lead, zinc and copper, although it is recognized that on applying the positive pole there is some movement of silver ions into the tissues, causing the liberation of oxygen and chloride and the formation of insoluble silver chloride.

On April 15 I removed the pharyngeal tonsils, which had been chronically enlarged for some time, causing nasal breathing. I ceased attendance on April 30.

On July 29 I received a report that there was not the slightest sign of the old trouble. I, myself, examined the patient on September 15, and again in January, and with the exception of very slight redness, no bigger than a pin's head, there was absolutely no sign of the trouble.

The treatment as applied in this case carries with it a certain amount of risk, owing to the proximity of important structures, but by exercising a little care the slight risk is, I think, warranted by the result.

There is, I think, no differential diagnosis requisite in this case, for there was no bulging or tumor of any sort in connection.

As the patient has now been a year without the slightest return of the old trouble, I think I am justified in claiming a cure.

This treatment in place of excision might also be applicable to a patent Thyroglossal duct and cyst, a somewhat different state.

REFERENCES.

¹ Chalmers Watson Encyclopædia Medica, Vol. 8, p. 240.

² Quain's Embryology, Vol. 1. part 1, p. 103, and Mr. Lockhart Mummery in reporting a case before the Society for Study of Diseases of Children.—B. M. J., Nov 4, 1905.

³ Electro-Physiologie, "Weiss," p. 127.

DIAGNOSIS OF ESOPHAGEAL LESIONS.¹

BY BERTRAM W. SIPPY, M.D.,

OF CHICAGO, ILLS.

Two classes of diseases of the esophagus may be distinguished—functional and anatomical. *Functional disease.*—There are two chief functional disorders of the esophagus. One is related to sensation; the other to motility.

Sensory Disorders.—The only disorder of importance relating to sensation is hyperesthesia. Hyperesthesia of the esophagus is not infrequently the cause of discomfort occurring during the act of swallowing. The discomfort may be burning or smarting in character, and is usually felt along the whole length of the esophagus, but may be referred to the epigastric region alone. There may be other manifestations of a neurosis present, such as tenderness along the spine, or hysterical stigmata elsewhere. One cannot be sure that hyperesthesia alone is present until after the passage of bougies, and, if possible, the use of the esophagoscope. In hyperesthesia of the esophagus, which usually extends throughout the whole length of the organ, as soon as a bougie passes beyond the pharynx and enters the esophagus the patient complains of great pain, which continues as the bulbous point of the bougie is pushed down the whole length of the esophagus. Hyperesthesia may be associated with slight spasm at any point in the esophagus, but real obstruction to the passage of bougies is not present. Upon passing the esophagoscope a normal mucous membrane is found. Such cases are not extremely rare. I have seen three during the last year.

Anesthesia of the esophagus may result from central lesions of the nervous system, or occur as a manifestation of a

¹ Read before the Chicago Surgical Society, February 2, 1906.

neurosis. No practical importance is as yet attached to the condition.

Motor Disorders.—Spasmodic contraction of the circular fibres of the esophagus may take place at any level of the tube. The so-called “globus hystericus” is due to spasm of the esophagus. Esophageal spasm is not usually followed by serious results, except when it occurs at the upper and lower ends. Esophageal spasm will be discussed with the other causes of stenosis of the esophagus.

Anatomical Disease.—Inflammation of the esophagus serious enough to be of clinical importance is not common, except when caused by the ingestion of caustic alkalies, acids, and metallic salts. Deglutition is painful and the history of the case will usually render diagnosis easy. If necessary, the esophagoscope may be used to differentiate the condition from hyperesthesia. Inflammation of the pharynx seldom extends to the esophagus. The esophagus is almost immune to diphtheria, and is rarely inflamed in measles, scarlet fever, small-pox, and typhoid fever. Tuberculosis of the esophagus is extremely rare; likewise syphilis. Actinomycosis of the esophagus has been described.

Ulcer.—Ulceration of the esophagus seldom occurs, except in association with carcinoma. There have been less than forty cases of peptic ulcer of the esophagus reported. Peptic ulcer may occur anywhere in the lower third of the esophagus. If at the very lower end, owing to the vascularity of the part, hemorrhage is likely to be a prominent symptom. Ulcer of the esophagus may be readily detected by the esophagoscope.

Esophageal Stenosis.—By far the most common and serious disorders of the esophagus are related to conditions producing obstruction to the lumen of the tube. The early diagnosis of esophageal obstruction is very important. The first symptom is usually discomfort or pain occurring during the ingestion of food. Whenever a patient complains of discomfort while eating, we should always think of the following conditions as possible causes: Disorders of the esophagus,

ulcer or carcinoma at or near the cardiac end of the stomach, perigastritis, perigastric adhesions, epigastric hernia, nervous dyspepsia, and gastritis. The discomfort or pain of esophageal stenosis is usually located at the seat of the obstruction, but may be referred to the epigastric region or to the back. As the stenosis increases, the patient may be conscious that the food is arrested at a certain point in the esophagus, and that greater time and effort are required to force the food into the stomach. The patient usually knows when the food passes the obstruction. As the lumen of the tube grows smaller, the sensation of fulness behind the sternum, due to accumulation of food above the seat of the stricture, increases. If an attempt is made to eat rapidly, a choking sensation results, and the contents of the esophagus are regurgitated. The patient frequently describes the act of regurgitation as vomiting. Whenever a patient complains of discomfort, pain or vomiting at the time of eating, we should never neglect to put him to the test, and observe what happens during the ingestion of food and drink. If stenosis has been present even for a short period, the patient has learned to eat slowly, to take small bits of food, and to reduce them by prolonged mastication. If the stenosis is considerable, even liquids are sipped slowly, and the act of swallowing is frequently repeated. That a distinct effort is required to cause the food to go down is clearly apparent. When urged to eat more rapidly, the patient usually indicates that it is impossible. Discomfort is evident; an attempt may be made to wash the food down with water. If unsuccessful, and the eating is forced, an involuntary contraction of the abdominal muscles and diaphragm takes place, and the contents of the esophagus, food usually mixed with a large quantity of mucus, flows out of the esophagus, without the expulsive effort that is usually associated with vomiting. Nausea is usually absent; although nausea and vomiting may be excited by the act of regurgitation. The patient is nearly always able to distinguish between regurgitation and vomiting, if his attention is called to the difference between the two acts. Pain, cramp-

like or dull in character, may be a prominent feature. Pain, however, is not invariably present. I feel justified in mentioning the apparently trifling details of the symptomatology of esophageal discomfort and regurgitation, because experience shows that grave error in diagnosis is constantly made. Esophageal disorders are mistaken for gastric disease; even gastro-enterostomy has been needlessly performed, when more careful attention to symptomatology combined with the observation of the patient while eating would have clearly shown that the disorder was located in the esophagus.

If the history and observation of the patient while eating make it probable that stenosis of the esophagus is present, a stomach-tube or bougie may be used to locate the obstruction. First, however, the patient should be carefully examined, to determine whether contraindications are present to the passage of such instruments. Aneurysm should be carefully excluded. High grade arterio-sclerosis, history of previous cerebral hemorrhage, heart incompetency, and other conditions may render the procedure unsafe. It is usually best to attempt to pass a soft stomach-tube first. The exact seat and degree of obstruction are, however, more accurately determined by a flexible bougie with graduated olive tips.

It is generally easy to diagnose and locate the seat of esophageal stenosis. To determine the nature of the obstruction is sometimes exceedingly difficult. In adults, carcinoma is by far the most common cause. This too often leads to serious error, since it is assumed upon insufficient evidence that esophageal stenosis is due to carcinoma. In a given case all other causes should be carefully considered before concluding that carcinoma is present.

The conditions that may lead to stenosis may be divided into extra- and intra-esophageal. Stenosis resulting from extra-esophageal cause is rare. Among such causes may be mentioned aneurysm, mediastinal tumors, spondylitis, pericardial effusion, esophageal diverticulum. Stenosis from intra-

esophageal conditions results from tumor, cicatrix, spasm, diverticulum, and foreign bodies.

Tumors of the esophagus may be benign, but are usually carcinomatous. Sarcoma may invade the esophagus from surrounding structures.

Carcinoma of the esophagus is characterized by the symptoms of stenosis, as described. The onset is usually gradual, although difficulty in swallowing solids may appear suddenly. As in organic stenosis from all causes, difficulty in swallowing solids usually appears first, liquids later.

The course is progressive, marked by slight variations in the difficulty in swallowing. Considerable improvement may be noted upon the administration of non-irritating liquid foods. A gain of several pounds in weight is possible for a time, by giving an abundance of milk and cream.

The location of the obstruction is of value in diagnosis. It is estimated that approximately fifty per cent. of all cases of esophageal carcinoma develop at the cardia, or immediately above, at the point where the esophagus passes through the diaphragm. About forty per cent. develop at or near the bifurcation of the trachea, and only about ten per cent. in the upper or cervical portion of the esophagus.

Metastatic growths are seldom of value in the early diagnosis of esophageal carcinoma, although they should be sought in the liver, cervical glands, lungs, pleura, and elsewhere. Since there is a tendency to early ulceration, a valuable diagnostic sign is the presence of blood in the stools, detected by the Weber test. Upon attempting to pass the stomach tube, odor characteristic of a sloughing mass often aids in diagnosis. The esophagoscope passed to the seat of the obstruction reveals either an ulcerating, bleeding, perhaps sloughing, mass, or nodular irregularities. Although a temporary gain in weight may be produced by appropriate feeding, the course of the disease is progressive. Emaciation and final cachexia supervene. After the first symptoms of difficulty in swallowing become manifest, the average duration of life is six or eight months.

Perforation into a bronchus is characterized by violent cough upon the ingestion of liquids. Broncho-pneumonia and death soon follow such a complication.

The blood changes of secondary anemia, such as are associated with carcinoma elsewhere, are of aid in differentiating benign from malignant stenosis.

Cicatrix.—Cicatrix causing esophageal stenosis is usually associated with a history of swallowing caustic acids or alkalis, although in some cases the incident is forgotten, and careful questioning is necessary to bring out such history. If the escharotic is strong, symptoms of stenosis begin at once. If mild, they may be delayed for several months. Cicatrix from peptic ulcer is an extremely rare cause of esophageal stenosis.

The history, course of the disease, and passage of bougies are usually sufficient for the diagnosis of cicatricial stenosis of the esophagus. If not, the esophagoscope may be used to advantage.

Diverticulum.—Diverticula of the esophagus are pouch-like sacculations of a portion of the circumference of the tube. Three forms based on etiology are recognized: Pressure diverticula, traction diverticula, and traction-pressure diverticula.

Traction diverticula are found frequently at autopsy, but seldom produce symptoms. The same may be said of traction-pressure diverticula. Pressure diverticula of the esophagus are relatively rare, but of much more serious import than the other forms. They usually develop at the upper end of the esophagus, or immediately above the left bronchus, or in the lower third of the esophagus. Clinically, the most important pressure-diverticulum is located at the upper end of the esophagus, and is known as Zenker's diverticulum. The origin of the sacculaton is at a natural defect in the posterior wall of the esophagus, just below the pharyngo-esophageal orifice. Accumulation of food at this point may cause a pouch-like sacculaton, which at first develops posteriorly, and later occupies a lateral position, usually to the left of the esophagus. As it develops, it projects downward along the course of the esoph-

agus. The capacity of the pouch varies from a few cubic centimetres to half a litre or more. In the early stages, slight discomfort such as dryness and irritation about the throat, is present. Later, the sensation of a foreign body may be noted, and, finally, difficulty in swallowing is experienced. As the sacculation increases, the accumulated food crowds the wall of the pouch against the esophagus, and obstructs its lumen. At such a stage difficult deglutition and regurgitation of food are present. In one-third of the cases a tumor is discoverable in the neck. It may be located behind or at one side; rarely on both sides, of the trachea. The patient often learns to empty the sac by making pressure upon it with the hand. A peculiar gurgling sound accompanies swallowing in many cases. *Fetor ex ore*, due to decomposition of food retained in the pouch, may be a prominent feature. It is often noted that swallowing is accomplished easier during the early part of the meal. As the sac fills, the esophagus is crowded upon, and its lumen obstructed. Upon attempting to pass a bougie it is usually arrested in the sac. If the bougie is slightly withdrawn, and the direction of its point changed, it may be passed into the esophagus. At times a large-sized bougie passes more readily than one with a small point. It frequently happens that a bougie may pass readily one day and not the next. Very little difficulty in swallowing may be present in cases in which it is impossible to pass a bougie. After swallowing liquids a small stomach tube may be passed to the seat of the obstruction, and the contents of the sac aspirated with an Ewald bulb. Secretions containing lactic acid and numerous micro-organisms may be obtained from the sac. Bismuth suspended in oatmeal gruel may be swallowed, and if sacculation is sufficient the X-ray will show the location and approximate size of the sac. The esophagoscope is rarely of much value in the diagnosis of diverticula.

Spasm.—Spasm of the esophagus may occur at any point in the tube. As a rule, contraction of the muscular fibres is not firm enough to produce obstruction, except when occur-

ring at the upper and lower ends of the esophagus. Stenosis from spasm of the upper end is usually slight, and will not be discussed further here.

Cardiospasm.—Spasm of the lower end of the esophagus, if long-continued, results in dilatation of the esophagus, and unless relieved, emaciation and finally death from starvation is likely to occur. Although not many cases are reported in the literature, the condition is not rare, and because of its seriousness the clinical picture should be more generally known. Normally, the cardiac end of the esophagus is closed by the contraction of its circular muscular fibres. During the act of swallowing, the circular fibres are automatically relaxed, and no hindrance is afforded to the passage of the contents of the esophagus into the stomach. If the automatic relaxing influence that occurs in swallowing is withdrawn, the closure of the cardiac orifice is firm enough to hold a column of water near the height of the esophagus. If the automatic force that should relax the cardia is impaired, or if a slight spasm of the cardia is present, food and drink accumulate in the esophagus, and if an attempt be made to eat or drink rapidly, regurgitation is likely to follow. If spasm is only slight, regurgitation may not occur, provided the patient eats or drinks slowly. Proportionate to the obstruction, the retention of food causes lateral pressure, which may be counteracted by an increase in the strength of the esophageal peristalsis. The tendency, however, is toward dilatation of the esophagus above the seat of obstruction. Following ordinary physiological laws, the muscular fibres of the esophagus hypertrophy, in their attempt to force the contents of the esophagus through the orifice narrowed by spasm. In most cases the spasm is so moderate that for several months and even years the increased strength of the esophageal peristalsis overcomes the obstruction sufficiently to prevent great loss in weight.

The continued overfilling of the esophagus caused by the spasm of the cardia leads to a fusiform dilatation of the organ. The retained food is likely to decompose, and cause irritation.

Thus inflammation and even ulceration of the mucous membrane of the dilated tube may arise. This is likely to be followed by reflex spasm of the cardia, and an increase in the obstruction. The capacity of the normal esophagus is about 100 c.c. The capacity of a dilated esophagus, caused by cardiospasm, varies from 150 to 1800 c.c. No doubt the extent of the dilatation is governed largely by the rapidity with which obstruction develops. If the retention of food is moderate, hypertrophy of the esophageal wall may keep pace and prevent undue dilatation. If retention is great before hypertrophy has had time to develop, the fusiform dilatation is likely to be proportionately large. In most cases the capacity of the dilated esophagus does not exceed five hundred c.c. The muscular spasm is on a nervous basis, hence the condition is likely to be found in nervous individuals. It has developed after profound emotional disturbances, such as fright, grief, and worry. In one case reported the difficulty in swallowing followed the suppression of menstruation. The patient feared she was pregnant. A blow on the sternum was the exciting cause of another case. The condition had developed during the course of acute infectious diseases, such as pneumonia and scarlet fever. A congenital case has been described.

The diagnosis of cardiospasm should not be difficult. The usual symptoms of stenosis at the lower end of the esophagus are present, with modifications peculiar to cardiospasm. The onset of the difficulty in swallowing may be sudden, or gradual. Mild grades of obstruction simply cause the patient to eat slowly. A sensation of fulness in the esophagus, and a feeling that the food and drink are arrested before they reach the stomach, is usually experienced. At first liquids are often swallowed with greater difficulty than solids. Before the esophagus is dilated, solids may be grasped by the peristalsis and forced through the cardia, while liquids more readily escape upwards. After dilatation occurs, obstruction is present alike to solids and liquids. Normally, immediately after swallowing food or drink, nothing can be aspirated from the

esophagus. When cardiospasm is present, several c.c. of liquid containing food particles and mucus may be regained from the esophagus even hours after the ingestion of food and drink. In the case under my own observation, 500 c.c. of water could be aspirated from the esophagus several minutes after it had been swallowed. The stenosis was so impervious to liquids that an ounce of olive oil given at night was recovered from the esophagus the next morning, practically without the loss of a drop, and yet, the lower end of the esophagus presented no anatomical narrowing. A very striking and diagnostic feature is that there may be little or no obstruction to the passage of the tube or bougie, even in cases in which a large quantity of liquid is retained in the esophagus. A very moderate spasm of the cardia may not be overcome by the peristaltic force of the most powerful hypertrophy of the muscular fibres above the seat of obstruction. As soon as the point of least resistance is above, regurgitation of food occurs. Normally, the thickness of the esophageal muscle varies from a half to two millimetres. In the case mentioned the hypertrophied muscle fibres were nine millimetres in thickness. No doubt several years were required for the development of such a hypertrophy. In the average case a bougie is arrested for a moment at the cardia, and then upon making slight pressure it passes through into the stomach. A large-sized bougie often passes as readily as one of smaller calibre. The difficulty in swallowing usually fluctuates more than it does when stenosis is due to organic disease. Excitement, overwork and worry are likely to increase the spasm. The patient may awake at night to find the pillow flooded with the contents of the esophagus. The horizontal position favors regurgitation. In organic stricture the retention of food and secretion in the esophagus is moderate compared to that which may be retained as a result of cardiospasm. X-ray pictures of the dilated esophagus may be obtained by causing the patient to swallow a five-per-cent. suspension of bismuth subnitrate in oatmeal gruel, until the "choking-up" sensation just short of regurgitation is developed. The esophagoscope

shows the cardia closed. The mucous membrane above the seat of constriction is reddened, and in some cases erosion and ulceration are present. Redundant folds of mucous membrane may be visible at the seat of the dilatation. Diverticulum causing obstruction at this point is so rare that there is seldom difficulty in differentiating the condition from cardiospasm. Rumpel's differential test consists in passing into the stomach a stomach-tube with many lateral perforations in its lower half; another tube without lateral perforations is passed into the diverticulum. Water is now introduced through the tube that is supposed to rest in the diverticulum. The diverticulum fills, and the excess passes into the stomach through the perforations in the tube that is introduced into the stomach. The quantity held by the diverticulum may now be withdrawn by using an Ewald aspirating bulb. If a fusiform dilatation is present, no water is regained because it will be lost by passing into the stomach through the perforations in the stomach tube. The successful issue of this test presupposes the ability to pass the perforated tube into the stomach, and the other into the diverticulum. If the results of the test are negative, diverticulum could not be thereby excluded. Modifications of this test of some merit have been made by Jung, Kelling, Krauss, Buckelmann, and others.

After dilatation of the esophagus occurs, unless the spasm is overcome, symptoms are likely to persist. As a rule, emaciation does not occur rapidly at first. The nutrition of the patient may not be greatly reduced for years. He learns to eat slowly and to help force the food down by taking a swallow of water, often combined with a deep breath. Other aids to swallowing are adopted, such as throwing the arms and shoulders backward, imitating the motion of the sea-gull in swallowing a fish. The motions used in rowing have also been used to aid in forcing the food into the stomach. Experience shows, however, that sooner or later the difficulty in swallowing increases. Regurgitation of food occurs more regularly and persistently. Emaciation develops, and starvation is the result, unless the spasm is over-

come or gastrostomy performed. Early diagnosis and relief of the condition are important, since after dilatation develops and becomes fixed and hypertrophied, the tube will always show some sacculatation, and predispose to the accumulation of food, which is likely to excite reflex spasm of the cardia, and cause a return of the difficulty.

The best treatment of the condition—forcible dilatation of the cardia—does not come within the province of these remarks.

POSTOPERATIVE ILEUS.¹

BY JOHN M. T. FINNEY, M.D.,

OF BALTIMORE, MD.,

Associate Professor of Surgery in Johns Hopkins University.

AMONG the serious complications which may follow a surgical operation involving the opening of the abdominal cavity, there is none, except secondary hæmorrhage, which more urgently demands an early diagnosis and prompt relief than intestinal obstruction. In isolated instances it has been observed after operations where the peritoneal cavity was unopened. Just at the time when the surgeon has begun to be relieved somewhat of his anxiety, and to congratulate himself that once more his labors have been crowned with success, it is most disheartening to patient and surgeon alike to be confronted with the added perils of a secondary operation. Fortunate is he who has never been called upon to face this distressing situation, and but few surgeons there are, I fancy, with an operative practice at all extended, who cannot recall some such experience, for, unfortunately, postoperative ileus is not a rare affection.

It has been my misfortune to have met with twenty-six cases of postoperative ileus in my hospital and private practice, twenty-two of which required secondary operation of one sort or another; and I am sure, although I have not complete records of these cases, that during this time I have seen an equal number in the practice of my colleagues in the Johns Hopkins Hospital, and elsewhere.

Baisch,¹ in a recent historical review of postoperative ileus, gives to Sir Spencer Wells² the credit of the first description of this condition, in a paper published in 1860.

¹ Read before the Chicago Surgical Society, February 28, 1906.

This case was due to an adhesion of a coil of intestine to the stump of an ovarian cyst. He also reports another case in which a loop of intestine was caught in the abdominal suture. Up to 1881, he had had one thousand ovariectomies, with eleven cases of postoperative ileus. These all died unoperated upon.

Schroeder³ in 1878 was the first to operate for this complication. His patient died. A year later, Olshausen⁴ reported a successful case. From this time, up to 1886, very little is found in the literature upon this subject.

Ileus following laparotomy was one of the subjects for discussion at the First Gynecological Congress, held in Munich, in 1886.

In 1894, Tuja⁵ reported forty-three cases, five of which were surgical. In this same year, this subject was first brought prominently to the attention of the profession in this country by Rohe⁶ of Baltimore, in his presidential address before the seventh annual meeting of the American Association of Obstetricians and Gynecologists, at Toronto. Previous to this time, all the reported cases had followed gynecological operations. Five years later, Schade⁷ collected one hundred and twelve cases, many of which had followed operations for hernia. Corner⁸ found from his study of St. Thomas's Hospital reports during the three years 1900-02 inclusive, that more postoperative obstructions occurred following vaginal hysterectomy than from all other pelvic operations combined.

Hawkins⁹ in a study of two hundred and twenty-four cases of acute appendicitis, reports ten deaths, four from intestinal obstruction, six from other causes. Two per cent. of all the cases, and forty per cent. of the fatal ones, were due to intestinal obstruction.

In 1899, Werth¹¹ recommended enterostomy for the relief of intestinal obstruction.

Postoperative ileus, of which alone this paper treats, differs little from ileus in general, except in the matter of causation. The diagnosis in these cases may be frequently

obscured by conditions which necessitated or were present at the time of the previous operation, infection, traumatism, influence of the anæsthetic, etc.

Attempts have been made to classify ileus, but, so far, a classification that is satisfactory to everyone has not been found. In the main, the classification of ileus in general applies to the postoperative variety, but with some modifications. Classified with reference to time, Broca's division of postoperative obstructions into two classes, early and late, is good, so far as it goes. The former class includes those cases which develop before the wound is completely healed, and contains by far the larger number of cases; the latter, those which develop after a period of perfect health of varying duration. The early cases present the greater difficulties in diagnosis owing to the fact that infection not infrequently plays a prominent part in the causation of the initial operation. The diagnosis of the late cases is, as a rule, comparatively easy, because of the absence of the element of infection.

Classified with reference to causation, the Mikulicz division into two main classes, mechanical and dynamic, is perhaps the most satisfactory. These in turn may be still further subdivided. Either of these varieties when unduly prolonged tends towards the development of the other, so that not infrequently they are associated in the same individual.

The two great factors concerned in the etiology of postoperative ileus are of either mechanical or septic origin. There is still a third and much smaller class in the development of which neither of these two forces is directly concerned, namely, those rare and interesting cases of adynamic ileus having their origin in disturbed conditions of the innervation and circulation of the intestine. We would, therefore, divide postoperative ileus into three main classes,—(a) mechanical, (b) septic, (c) adynamic. But a hard and fast distinction is difficult to maintain owing to the fact that they may all be present in the same individual.

The diagnosis of obstruction is all-important. Once this

is established, the treatment is determined, since there is but one rational course to pursue. It, of course, is obvious that the earlier the diagnosis is made and the necessary relief accomplished the better. The main point to be determined in considering the question of diagnosis is, as a rule, to differentiate between the mechanical and the septic variety, since these are the two forms most often met with, the mechanical being very amenable to treatment, the septic to a less degree.

It is often difficult, sometimes impossible, to differentiate the mechanical form from the other forms of ileus, since neither condition presents any special symptom-complex which may not at times be simulated by the other. In a general way, mechanical ileus is characterized by its later onset, the presence of visible peristalsis, severe colicky pains with slight changes in the character and rate of the pulse, and little or no rise in the temperature at first, and asymmetrical distention. Where peritonitis is present, the picture is obscured, the infection masks the obstruction; the septic symptoms usually predominate. Where, following an operation, an ileus develops unaccompanied by the above-mentioned symptoms, one has probably to deal with the adynamic variety.

It goes without saying that it is important to determine the pathological condition present and its location both with reference to the portion of the intestinal canal obstructed and its place in the abdominal cavity. In some cases it is comparatively easy to accomplish both of these desired results; in other cases it is manifestly impossible.

The location of pain, its colicky character, tenderness and swelling, asymmetrical enlargement, patterns of distended coils of intestine, localized areas of dulness or tympany, character of vomitus, examination of the urine and blood, audible gurgling, etc., are all of great value taken collectively, but, individually, no one of them is of any special diagnostic significance. Colicky pains, "trouble with the bowels," distention, etc., occurring within a few days after abdominal operation, or even some months or years later, should make one suspicious

at once of the possibility of a partial or beginning intestinal obstruction, and if these symptoms continue unrelieved for any length of time, should raise the question of the advisability of an immediate exploratory operation.

Since this condition when unrelieved leads to a long train of serious consequences, so far as the patient's health and life are concerned, such as disturbances in the circulation of the mesentery and bowel and their sequelæ, hyperæmia and hæmorrhage with infarct, ulceration and gangrene of the bowel, the absorption of toxins from the obstructed loop of intestine, great distention of the intestine, etc., it is of the utmost importance that every endeavor should be made to establish an early diagnosis and bring about adequate relief.

As to the causation of the different forms of ileus, the early obstructions are in the vast majority of instances due directly to infection and its results. The later cases are more often due to old inflammatory adhesions which may have been drawn out into the form of bands and around or beneath which coils of intestine have become constricted. It will be seen, therefore, that the septic or adynamic forms of ileus occur more frequently in the early obstructions, while in the later ones the mechanical variety predominates.

Just why inflammation of the peritoneum causes intestinal paresis, whether it is due to œdema or reflex action, vasomotor disturbances, or the local effect of the toxins upon the nerves of the intestine, is not known, but that all these factors are concerned is highly probable.

The symptomatology of ileus varies with the causation. In the early cases where the possibility of infection exists, one is likely to find in certain cases symptoms suggesting peritoneal inflammation, more or less localized. It is very difficult, indeed impossible, in many cases to differentiate between a peritonitis and an ileus whether mechanical or adynamic. In fact, as has been said, one meets not infrequently with cases in which they coexist. For instance, Case II of our series, where on the fourth day after an operation for the removal of a gan-

grenous perforated appendix in which a spreading peritonitis was found present, symptoms of ileus developed. Through the wound of the previous operation I exposed and incised a distended coil of intestine, and through a rectal-tube irrigated this loop of bowel. While passing the tube into the bowel through this fistulous opening, and distending it with water from a fountain syringe, a sudden loud gurgle was heard and in a short time the patient had a free evacuation with a passage of a large amount of flatus and complete relief from his symptoms. The symptoms presented by this patient are those usually met with in cases of mechanical ileus, namely, colicky pains accompanied by distention more or less localized, visible peristalsis, and later the appearance of vomiting and obstinate constipation with marked restlessness, yet at the primary operation a well-marked peritonitis had been present. Where symptoms such as these develop shortly after a surgical operation, particularly when there has been some infection of the peritoneal cavity requiring drainage, one should be suspicious at once of the development of an obstruction. Instead of drenching the patient with cathartics, enemata and gentle massage of the abdomen, where the patient's condition admits of it, should be tried. Moderate attempts at catharsis are not contraindicated as a rule, but these failing, further efforts in this direction should be discontinued. Recourse should be had at once to other aids in establishing a diagnosis. A leucocyte count may be of some assistance, but unfortunately the leucocytes are usually found increased in the presence of intestinal obstruction as well as in inflammatory conditions. Some of the highest counts we have observed have been in this connection.

During the past few months Dr. Charles E. Simon has investigated the opsonic content of the blood of a series of abdominal operations which occurred in my service at the Union Protestant Infirmary. He was particularly impressed by the very high values which he obtained in certain cases of appendicitis. Making use of his method of dilution, which

has been described in the January number of the Johns Hopkins Hospital Bulletin ¹⁰ he found that in these cases phagocytosis to the extent of from ninety to one hundred per cent. may still be demonstrable with a dilution of 1.30 and even at 1.40, as contrasted with an average normal value of thirty-five for a dilution of 1.30 and of nine for 1.40. In a small number of obstructive cases, on the other hand, values were obtained which were essentially normal. I accordingly suggested that experiments be undertaken to ascertain to what extent the determination of the opsonic content of the blood might be of service in distinguishing between infective and primarily obstructive cases. This work has been conducted by Dr. Nelson of the Infirmary staff in association with Dr. Simon. Dogs were used for the experiments and obstruction produced by ligating the intestine with tape or broad pieces of gauze. The absolute leucocyte count, the differential count, and the opsonic content were determined before operation, and thereafter three times in the twenty-four hours until the death of the animal, or until recovery had taken place. Unfortunately the number of experiments of which I have notes is small, as the investigation was only begun a few weeks ago. The work, however, is being continued and I will probably have occasion in the future to revert to it.

From the experiments which have been made, it is clear that neither the absolute nor the relative count *per se* will suffice to differentiate a simple obstructive from an inflammatory condition of the peritoneal cavity. In one of the dogs the absolute count reached a remarkable height,—viz., 62,000 within twenty-four hours after the ligature had been applied. The relative count also did not prove to be of service. Polynuclear, neutrophilic increase associated with eosinophilic decrease, which is to be constantly met with in infections with the common pus organisms and which Dr. Simon speaks of as the septic factor, was likewise met with in the obstruction experiments.

The opsonic curve on the other hand is rather interesting.

Generally speaking the values indicate fluctuations which for the low dilution of 1.10 may show a periodical increase, but on the whole there is but little deviation from what we may regard as normal for the dog. With the 1.20 dilution on the other hand, the figures are rather subnormal than normal in value. There is at no time evident a well-maintained increase such as is seen in the human being in certain infections.

As I have remarked, our series of animal experiments is as yet too small to warrant any definite conclusions, but the results obtained appear suggestive and worthy of further study.

Much importance was attached at one time to the examination of the urine. It was hoped, owing to the encouraging report of Jaffe,¹² that the presence of increased amounts of indican in the urine would be of considerable importance as a diagnostic aid but later observations have shown this substance to be present in increased amounts in certain constitutional diseases,—for instance, anæmias, starvation, empyema, cancer of the uterus and stomach, etc. In fact, it can usually be obtained in increased amount where any extensive suppurative process is present in any part of the body. Gehrhardt points out that therefore indicanuria can be of diagnostic value in intestinal obstruction only when all these other conditions can be excluded. As this test is of value only in obstructions of the small intestine, its field of usefulness is necessarily limited, and, for the reasons already stated, it is practically valueless.

Vomiting in these cases is an early and important diagnostic sign and usually becomes pronounced.

Reversed peristalsis is usually assigned as the cause of this phenomenon but the experimental researches of Magendie,¹³ Roger,¹⁴ Loevinsohn¹⁵ and others tend to discredit this assumption, and show that the abdominal muscles are very largely concerned in its production. Mall's¹⁶ interesting experiments would also rather confirm this view.

The distention noted is due to the rapid formation of gas in the lumen of the intestine. It is interesting to note that physiologists are singularly silent as to the method of gas

production in the intestine. Krehl ¹⁷ in his work states that the gas normally found in the intestine, and in much larger quantities in cases of peritonitis, ileus, etc., may have two sources, viz. : (1) The swallowed air. This consists of oxygen and hydrogen, the former readily absorbed by the blood while the latter is absorbed with difficulty and is what would be found chiefly in the intestine. In the meteorism of hysterical patients, he thinks this is the chief source, especially as in this condition the tonicity of the intestinal wall may be supposed to be lowered, and this would allow of greater distention. (2) The gas produced by fermentation, such as hydrogen, marsh gas, carbon dioxide, sulphurated hydrogen and nitrogen. The carbon-dioxide would be absorbed quickly, the sulphurated hydrogen would give an odor, but is produced in small quantity and only from proteid. It would also be absorbed quickly, so that the hydrogen, marsh gas and nitrogen would be the ones likely to give rise to distention.

In cases of obstruction and shock, this distention might be great, owing to the loss of tonicity in the bowel-walls, which would prevent their passing on the gas, and also prevent the normal digestion of the food and thus give a greater chance for fermentation. Along with this there is also a markedly lowered power of absorption from the intestinal mucous membrane, which would augment the accumulation of gases and also retard the normal digestion of the food, leaving it a prey to the bacteria present in the intestinal canal. Fermentation may thus proceed very rapidly under these conditions and the laxity of the walls of the intestine would, of course, facilitate the accumulation of gases both by preventing their onward movement and by obstructing the circulation in the intestine.

In this connection and as helping to explain the restlessness and later the great prostration noticed in advanced cases of ileus, the work of Nesbitt,¹⁸ and Clairmont and Ranzi ¹⁹ is most interesting. Nesbitt in some experimental work conducted upon dogs in the pharmacological laboratory of the Johns Hopkins University found in complete occlusion

of the small intestine at its lower end, the constant occurrence of cholin and neurin along with other bases, provided the food ingested contained any considerable quantity of lecithin. It is not improbable, he thinks, that still other poisonous substances are formed by bacterial action from other constituents of the food in cases of intestinal obstruction. While cholin is relatively harmless in its action, neurin must be classed with the exceedingly active poisons. It has been conclusively shown by Nesbitt and other observers quoted by him that neurin may be formed from cholin by bacterial action. In its physiological effect, neurin is very like muscarin. Especially to be noted here is its paralytic action on the heart and its effect upon the intestinal movements. This work explains certain clinical phenomena observed, and proves conclusively that highly toxic substances are formed in the intestinal canal during its complete occlusion. Lavage of the stomach and intestine will mechanically lessen the amount of toxic substances absorbed.

This fact is well illustrated in Case IX of our series where on the fifth day after the removal of a gangrenous perforated appendix, symptoms of ileus developed, one of the most marked features of which was intense restlessness. After incising a distended coil of intestine through the wound, and evacuating a large amount of fluid contents and thoroughly irrigating the neighboring coils of intestine through a rectal-tube, his condition at once improved and his restlessness and delirium very quickly disappeared, accompanied by a corresponding drop in the pulse rate. Six days later, when the intestinal fistula spontaneously closed, a recurrence of these symptoms was noted, which was promptly relieved by reopening and again irrigating the intestine.

Nesbitt further points out that if the fate of lecithin in the intestinal canal, which is not definitely known, is as Broca assumes, then caution should be observed in the use of certain foods that have been considered heretofore most nutritious and healthful. Chief among these are eggs, which are rich in

lecithin and which when broken up in the intestinal canal by bacterial action may under certain conditions set free large amounts of poisonous neurin.

Clairmont and Ranzi in their interesting paper point out the fact that the filtrate of normal intestinal contents injected into animals produces no results, while the filtrate from the afferent loop of an ileus produces very grave and even fatal results when injected into animals in large enough doses. These experimenters also found that the filtrate from the intestinal contents of an ileus of the small intestine possesses much more marked toxic qualities than that from the large bowel, and that the symptoms were the same in experimental ileus in animals as in the human subject. Kukula²⁰ has been able to isolate putrecin from the contents of a strangulated loop of bowel in a hernial sac. These observations all help to explain the toxæmia and paresis of the bowel observed as one of the later phenomena to develop in the course of an intestinal obstruction.

The shock and intense depression observed in the unrelieved cases is accounted for by the disturbed circulation in the obstructed portion and by the absorption from the afferent loop of poisonous toxines such as those described by these observers, in quantities sufficient to give rise to profound depression of the vital centres and at times even to death itself.

F. T. Murphy, of Boston (private communication), in some observations on experimentally-produced ileus in cats finds that an obstruction to the venous flow in the constricted loop was the greatest factor in producing the classical symptoms. In cases where the arterial supply was cut off, the symptoms were fairly well marked after eighteen to twenty-four hours. If examined after one-half hour, very little change was found in the obstructed loop.

In cases where the arterial supply was not cut off, but where the venous return was obstructed, there was very evident and almost immediate distress.

Within thirty minutes to an hour the animals vomited

and lost their muscular tone. These animals usually died within twenty-four to thirty-six hours. The abdomen opened one-half hour after such an operation, showed the walls of the obstructed loop markedly discolored and œdematous and much bloody fluid was found in the abdominal cavity.

Microscopically, the intestine with the obstruction to the venous return showed much more rapid and greater destruction to the mucous membrane than those with the arterial supply or the whole mesentery cut off.

Murphy thinks a vasomotor paralysis plays an important part in the production of the collapse so frequently noted in severe cases. In the production of this paralysis, the obstruction of the venous flow seems to be the important factor.

As to the frequency of occurrence of this complication, as already indicated from my own experience, and after a more or less careful survey of the literature, it can be stated that it is by no means rare. It is rather remarkable, in fact, that it is not more frequent when one considers the vast number of operations being constantly performed, and that by surgeons of limited experience, unskilled in the niceties of surgical manipulation and in the refinements of the art, where unnecessary traumatism of the exposed peritoneal surfaces is not infrequently inflicted. This, together with faulty methods of peritoneal drainage and deficient care of patients after surgical operations, makes it rather a source of wonderment that so few instead of so many cases are the subject of this grave complication. Undoubtedly some deaths are attributed to peritonitis which are due to intestinal obstruction and *vice versa*.

The symptoms of the two conditions, as pointed out by Warbasse,²¹ are so nearly identical as to make the diagnosis at times very difficult. "The clinical pictures," said he "are so similar that were it not for the peculiar symptom of the rigidity of the abdominal muscles observed in peritonitis, it is often difficult or impossible to distinguish intestinal obstruction from peritonitis. Clinically, paresis of the bowel is the

same as intestinal obstruction, and gives rise to the same symptoms."

Peck²² points out that many of the cases of postoperative obstruction are due to kinks and bands which partially constrict the lumen of the bowel, until an attack of indigestion or some indiscretion in diet, produces an unusual gas formation in the afferent loop, with increased peristalsis acting against the point immobilized by the adhesions. The obstruction thus becomes complete and gas ceases to pass the obstructed point. This is well illustrated by Case VIII of our series. This patient was a boy fourteen years of age who twelve days after the drainage of a large appendicular abscess developed the usual symptoms of intestinal obstruction. He had been progressing favorably except for slight difficulty in obtaining a satisfactory bowel movement, when after eating heartily of fruit cake given him by a foolish mother, vomiting, visible peristalsis, meteorism and obstinate constipation developed. His leucocytes advanced from normal to twenty-two thousand. After enemata and mild cathartics had failed, the abdomen was re-opened. The second incision was made through the left rectus because he referred his pain to this side and the visible peristalsis seemed to stop at this point. A kinked loop of ileum was found adherent about a small localized abscess between coils of intestine; this was evacuated and disinfected, the loop freed, and the abdomen closed. The patient made a prompt recovery.

In some cases early palliative treatment may be effective in avoiding the necessity for a secondary surgical operation. Provided the obstruction is in the large bowel, it may be possible to straighten out the kink or possibly disentangle a volvulus by elevating the patient's hips, distending the large intestine with water through a tube passed into the rectum, abdominal massage, atropine in large doses, etc. This is illustrated by two cases in my series, one of which is of unusual interest on account of the number of times volvulus has developed and been relieved in this manner.

This patient, a man, aged forty-seven years, was first admitted to the Johns Hopkins Hospital in January, 1890, with a history of definite intestinal obstruction lasting for six days. The history suggested volvulus of the sigmoid. Attempts were made to relieve by large enemata but to no avail. Dr. Halsted operated; median incision. Colon enormously distended down to the sigmoid, which was found to be the seat of a complete volvulus. No peritonitis, mesosigmoid large and broad; volvulus untwisted. Closed without drainage.

The patient had no recurrence until two years later, when he returned to the hospital with a history of obstruction of five days' duration. Enemata gave only partial relief. After several days an operation was performed; some coils of small intestine were found adherent to the line of previous incision. A long narrow band 5 mm. in diameter, 15 cm. long, extending from a point on the descending colon to the anterior abdominal wall. A loop of descending colon was caught behind this and almost completely constricted. The band was ligated and excised. The colon was enormously distended and mesocolon abnormally long throughout its entire length. A complete volvulus of the sigmoid was found. Recovery good.

Since that time up to January 1, 1906, the date of his last admission, he has returned to the hospital just twenty-eight times, averaging two attacks a year, for the relief of his recurrent obstruction. It has been possible in all of these attacks to relieve him completely by elevating the hips and distending the rectum and sigmoid with water. I may add that he will not agree to a radical operation directed toward preventing the recurrence, preferring to get along as he is.

The other was a youth of 19, operated upon during an attack of mild catarrhal appendicitis. The patient made an uninterrupted recovery for five days, when he began to complain of some discomfort in the bowels, which had not been satisfactorily moved up to this time. Enemata only partially effectual. Cathartics no better. On the eighth day he began to vomit and visible peristalsis was noted. Temperature slightly elevated. Abdomen moderately distended. His pain was referred to the left lower quadrant. The patient's hips were well elevated and the rectum and sigmoid distended with large enemata. Vigorous massage

and kneading of the abdomen were administered at the same time. After one-half hour of this, an audible gurgle was heard and in a few minutes a copious movement of the bowels took place, with the escape of a large quantity of flatus, accompanied with complete relief of his symptoms.

Dr. Thomas S. Cullen has kindly furnished me with a report of a somewhat similar case, a patient of his who ten days after an operation for diffuse peritonitis from a ruptured appendix developed symptoms of intestinal obstruction. The patient lived a long distance in the country, and three days after obstructive symptoms had developed he was removed to the city, which necessitated a long drive over rough roads with a good deal of jolting. When he arrived at the hospital his condition was better, his vomiting, which had been fecal in character, subsided, and he shortly had a succession of bowel movements with complete relief of his symptoms.

A point of considerable interest to all abdominal surgeons is the question of the formation and disappearance of adhesions in certain cases where the abdomen had been opened and found to be the seat of a well-developed peritonitis. The fact that in some cases the adhesions disappear completely and that early, and in others they do not disappear at all, or, at any rate, to a very much less extent, has been noted by many observers. The reason for this is, to my mind, not altogether clear. The presence of fluid, salt solution, effusions of one sort or another, etc., have been assigned by some as the cause for their nonappearance. Early change of position, massage, vigorous catharsis, doing away with drainage, lessening traumatism, absence of all foreign bodies in the peritoneal cavity, have been assigned by others.

I was much impressed in one case of my series by the absence of adhesions, Case XI—Dr. G., upon whom I had operated three weeks previously for a perforating typhoid ulcer with the existence of a widespread peritonitis. At that time, I was in the habit (a practice which I have since discontinued) of irrigating thoroughly the peritoneal cavity and

removing by vigorous wiping with pledgets of gauze the fibrin adherent to the intestinal loops. This had been thoroughly done after a more or less complete evisceration. At the time of the second operation, three weeks later, not a single adhesion could be found in the abdominal cavity except at the point of suture of the perforating ulcer, which had adhered to another coil of small intestine and produced a sharp angulation of the adherent coil, which in turn had given rise to the obstruction.

On the other hand, in Cases IV and VII adhesions of the densest character were found matting the intestines together into a fused mass which it was impossible to unravel. All three of these cases had been subjected to the same treatment; traumatism of the intestinal coils more or less marked, well-marked peritonitis, extensive gauze drain, intestinal paresis quite well developed for several days after the initial operation, etc., with diametrically opposite results, so far as the formation of adhesions was concerned.

This brings up the question of the ability of the surgeon to limit the formation of peritoneal adhesions. My experience leads me to believe that the production of adhesions and their subsequent disappearance is a matter over which the surgeon has little control. One can do a certain amount toward preventing their formation, but it is impossible to prevent them altogether. Sonnenberg, quoted by Loevinsohn, is of the opinion that toxines passing through the intact bowel-wall give rise to adhesions in those cases where they are present without demonstrable lesion.

Baisch reports a series of experiments upon animals intended to show the causation. He produced a variety of lesions of the peritoneum, parietal and visceral. He concludes from his observations that the formation of adhesions is dependent upon the presence of blood, even in minute quantity, in the peritoneal cavity. He conducted two series of experiments, producing similar lesions in each. In the one complete hæmorrhage was employed. In the other, varying amounts of blood were allowed to remain in the peritoneal cavity. In the first

series, no adhesions developed, while in the other they were constantly found present.

In support of this proposition, he quotes the statistics from Zweifel's clinic, noted for his blood-free technique, who, in eight hundred laparotomies, had only two cases of postoperative ileus, both of which occurred in cases exhibiting extensive adhesions at the time of the primary operation.

Martin has recommended the application of sterile oil to the denuded areas.

Cargile membrane has a very limited usefulness. The presence of fluids,—for instance, salt solution, in the abdominal cavity is of doubtful efficacy owing to the rapidity of absorption.

W. J. Mayo's²³ suggestion that the presence of fluid in the abdomen prevents the formation of adhesions in the case of tuberculous peritonitis is probably correct, but in that disease the fluid is in quite large amount and remains for a long time. The two conditions are hardly analogous.

The limiting of the amount of packing and the use of materials which least excite adhesive peritonitis are to be recommended. It is well to avoid drainage altogether where possible, but, in case it is necessary, the greatest care should be exercised in the proper placing of the drain. If a drain can be so placed as to be surrounded on the one side by visceral and on the other by parietal peritoneum, the chances of the formation of obstructive adhesions are much lessened.

Early catharsis, recommended by some, is of questionable value. In fact, it seems to me to be contraindicated in a considerable number of cases. The early rather extravagant claims of the advocates of atropine and eserine have not been borne out by more extensive observations. Frequent change of position may be of advantage in certain conditions. It is obviously impossible in others. For instance, in that interesting group of cases of dilatation of the duodenum and stomach, gastromesenteric ileus (of Zade) due to obstruction of the duodenum by the superior mesenteric vessels, associated

with Glenard's disease, it is indicated. In one of the fatal cases of my series, this was the cause of death.

This patient, a woman, aged forty-six, had been operated upon eighteen months previously by another surgeon for some pelvic trouble. On September 7, 1904, I did a pyloroplasty for persistent indigestion, nausea and vomiting. The pylorus was somewhat contracted with a scar on the anterior wall. The stomach moderately dilated; pylorus and duodenum high up under the liver. The patient began vomiting after recovery from ether. This persisted unrelieved for seven days in spite of lavage, etc. Vomitus odorless, bile-stained. Pulse rapid, weak throughout. Bowels moved well. Patient had slight cough. Died seven days following operation.

Autopsy showed beginning bronchopneumonia of left lung. Suture perfect; no sign of peritonitis; stomach moderately dilated, the first portion of the duodenum markedly so up to the point where it passes beneath the mesenteric vessels. Below this point the intestine was collapsed. On opening the intestine at this point, no lesion was found. Small intestine was pushed well down into the pelvis. Had a diagnosis of the cause of the ileus been made earlier, a change in position might have brought about relief.

It would lead us too far afield to discuss at this time this most interesting variety of ileus, originally described by Rokitsky²⁴ in 1842, and which has of late begun to attract attention among abdominal surgeons, but it is a fact worthy of note in passing that Dr. Byron Robinson,²⁵ of Chicago, in 1900 appears to have been the first one in this country to bring this condition to the attention of the profession in a publication. In a recent communication to the Johns Hopkins Medical Society, I gave credit to another, but on further investigation, I believe it properly belongs to Dr. Robinson, and I take this opportunity of correcting my former misstatement. Those who are interested, I would refer to Dr. Robinson's original article in the Cincinnati Lancet Clinic, December 8, 1900, and to the recent reviews of the subject by Zade,²⁶ Kelling²⁷ and Neck.²⁸

From a study of my own series, it would appear that obstruction occurs in the majority of cases early,—that is, before the patient leaves the hospital, fourteen occurring early and twelve late, according to Broca's classification. The disparity in number between the two groups, however, does not seem to be as great as one would naturally suppose. Of the fourteen early ones, ten occurred within the first week, all within three weeks. Of the late cases, five occurred within six months and three were over five years.

Of my series of twenty-six cases, twenty-two were operated upon a second time for obstruction. Appendicitis, acute or chronic, seems to have been the most fruitful cause. Sixteen or 61.5 per cent. followed appendicitis, either acute or chronic. Two followed operations for strangulated hernia, two typhoid perforation, two cholelithiasis. One case each followed operations for pyloroplasty, tuberculous peritonitis, volvulus and nephrotomy. The last was the only case of my series in which the peritoneal cavity was unopened. Although only two cases of my series were associated with hernia, it is a very important etiological factor, as pointed out by Schede.

A most interesting case of postoperative obstruction has recently occurred in the Surgical Clinic at the Johns Hopkins Hospital. The patient, an old man, upon whom perineal prostatectomy had been performed by the house-surgeon, Dr. Sowers, gave a history of having had a right inguinal hernia for forty-five years and one on the left for four years. The note at the time says "a double inguinal hernia most marked on the left side. Easily reduced." During the operation for prostatectomy, both herniæ were reduced. The patient stood the operation well but vomiting began within a few hours. This continued in spite of lavage and rectal feeding. Abdominal pain was pronounced. Most of his pain was referred to the bladder and supposed to be due to the operation. Constipation was present, no result from the enemata.

On the second day it was noticed that the amount of urine was much diminished. It was supposed then that his trouble was due to suppression of the kidney function. His condition

remained practically unchanged up to the time of his death, on the fifth day. His abdomen was only moderately distended and nothing specially noted here. It was supposed his death was due to suppression of urine and asthenia.

The autopsy showed a cloudy swelling of the kidneys. Marked arteriosclerosis. Intestinal coils were distended and pale except a number of coils in the right iliac fossa, which were dark red; the small intestine collapsed for a considerable distance from the ileocæcal valve. At this point a volvulus was found with a twist of one and one-half turns. On untwisting the intestine, the mesentery was found thickened and coils of intestine adherent to each other, and to the thickened mesentery by old fibrous adhesions; the reduction of the adherent hernial loops *en masse* had produced the obstruction. The diagnosis was obscured in this condition by the absence of signs referable to the hernia; the subjective symptoms all referred to the bladder.

The cause of obstruction was kinking in seven cases; adhesions alone, seven; bands, three; volvulus, two; loop caught beneath adherent loop, one; cicatricial stenosis, one; gastro-mesenteric ileus, one; adynamic ileus, one; cause unknown in three. In twenty-three of the cases the cause of obstruction was definitely known. Of these, in eighteen, or 78 per cent., the obstruction occurred either directly or indirectly as the result of peritoneal adhesions. It will thus be seen that of all the factors concerned in the causation of intestinal obstruction, peritoneal adhesions exercise by far the greatest influence.

The seat of the obstruction was in the small intestine in twenty cases, within the lower twelve inches of the ileum ten, exact position not stated ten, pylorus or duodenum three, sigmoid two, ascending colon one.

Peritonitis more or less general was present at the time of the primary operation in fifteen cases. At the time of the secondary operation it was found present in eight. It was the cause of death in three of the fatal cases. The treatment employed was freeing of the adhesions in nine cases, enter-

ostomy in nine, primary intestinal anastomosis in two, exploratory laparotomy, nothing done, in two; no operation in four.

Of the fatal cases, four died without relief from the obstruction, three from peritonitis, and three from symptoms suggesting toxæmia.

That drainage plays a very important part in the development of postoperative obstruction is agreed by all surgeons. It is somewhat surprising then to note that of our series, sixteen cases were drained, whereas ten, 38.4 per cent., were not drained. Drainage, therefore, is not the only factor to be considered.

Enterostomy was performed nine times; in three instances it was followed later by a secondary anastomosis. Of these cases, four recovered and five died. The value of enterostomy in intestinal obstruction is as yet undetermined, but that it has a place and that it is a life-saving procedure in many instances cannot be gainsaid. That it has obvious objections, is equally apparent. In a recent communication by Dr. Pancoast and myself²⁹ we have called attention to some of its advantages. That I have saved life by the establishment of an intestinal fistula where more extensive operation was out of the question, I am perfectly convinced.

Where bands exist they should be excised, adhesions should be freed and the intestinal coils placed in as favorable position as possible to prevent obstruction from the formation of subsequent adhesions. Where the bowel has been injured and its viability is doubtful, it is better when possible to do immediate resection followed by anastomosis. This is illustrated by Case XXI, whom I operated upon for a strangulated femoral hernia. The bowel looked a bit doubtful, but owing to the patient's poor condition I deemed it wiser to take the chances and dropped the injured loop back into the abdominal cavity. She made a good recovery, but began to complain, after a few weeks, of symptoms of intestinal obstruction. These increased in severity until the obstruction became almost complete. Seven months after the initial operation, I reopened

the abdomen and found an obstruction of the intestine due to a tight cicatricial contraction at the point where the bowel had been found constricted at the previous operation. The lumen at this point was not more than 5 mm. in diameter. I did a lateral suture anastomosis. She made a good recovery.

In my series, there was but one case of adynamic ileus unassociated with peritonitis and this was the only case in which the peritoneal cavity was unopened.

This patient, a man aged forty years, suffering from persistent hæmorrhage from the right kidney, was operated upon by another surgeon. I was present at the primary operation, which was very well done, no undue traumatism having been inflicted. The kidney was exposed without much difficulty, incised and drained. The patient stood the operation well but took the ether rather badly. Shortly after the operation, a moderate amount of meteorism developed, which persisted for four days in spite of all efforts to overcome it. During this time there was no movement of the bowels and vomiting had been persistent and most distressing. The vomitus was chiefly bile-stained fluid, containing no fecal odor. At the end of this time, the patient's condition becoming distinctly worse, it was thought best to explore.

I opened the abdomen on the fifth day and after a careful exploration of the entire abdominal contents, could find nothing except a universal distention of the intestinal tract. It seemed perhaps a little more marked in the ascending colon than elsewhere. There was no sign of peritonitis. A rectal tube was passed and a considerable amount of gas and feces was syphoned off by stripping the intestine downward in the direction of the fecal current. This was followed by only temporary relief, meteorism recurring on the next day. An enterostomy was performed in the hope of relieving the distention, but it was of no avail. Apparently an infection of the peritoneal cavity occurred at the point of the enterostomy wound, for some days later the patient died with symptoms of peritonitis.

Autopsy showed a fresh peritonitis starting from this point, grafted upon a universal distention of the intestinal coils. This

was the only death in my experience that could in any way be traced to infection from the enterostomy opening.

As has been said before, postoperative ileus other than the mechanical variety is most frequently associated with an inflammation of the peritoneum, more or less widespread. That a circumscribed peritonitis will stop peristalsis cannot be denied. Just how this is brought about is not definitely known, but that it is at times observed associated with a very sharply localized peritonitis of a low grade, is illustrated by a case reported by Dr. Halsted.³⁰ This patient was operated upon for gall-stones. At the operation there was found an ileus of the first portion of the duodenum and the pyloric end of the stomach. Corresponding accurately to this distended portion of the bowel, was a slight peritonitis scarcely more than an injection of the serosa and an exudate only enough to cause very slight adhesions between the duodenum and gall-bladder. The vascular injection seemed to correspond accurately to the limits of the dilatation.

Disturbances more or less marked to the innervation and circulation of the bowel-wall are certainly important factors in the causation of these forms of ileus, but, in addition to this, it is highly probable that the absorption of toxins, as referred to earlier in this paper, from the obstructed portion of the bowel, plays a most important part, the full significance of which is not at present understood.

Reichel³¹ has shown by experiments that artificial kinking of the intestine is of itself not enough to produce complete occlusion, but in addition there must be a surrounding peritonitis. He concludes that the greater number of such instances have peritonitis as the primary factor. Over-distention by large and frequently repeated enemata has been known to be followed by temporary intestinal paresis.

CONCLUSIONS.

(1) Broca's classification into early and late varieties simplifies the diagnosis. In the former class, which so fre-

quently is associated with peritonitis, the differential diagnosis as to variety is always difficult and often impossible. In the latter, which is composed almost exclusively of the mechanical form, it is usually easy.

(2) Adhesions are the chief factor to be reckoned with in an attempt to prevent the occurrence of postoperative ileus, and efforts directed toward this end are likely to be productive of the best results.

(3) That drainage exercises a marked influence in the production of adhesions cannot be denied.

(4) Treatment.—Prompt operation is indicated in every case after palliative measures have been given a fair trial and have failed. The character of the operation depends upon the nature of the obstruction and the condition of the patient.

(5) The prognosis is unfavorably influenced by the presence of infection. In its absence, it is excellent.

REPORT OF CASES.

CASE I.—Mr. M., aged 47, admitted January 9, 1890. History of obstruction of one week's duration. Volvulus of the sigmoid; mesosigmoid very long and broad. Gut untwisted and wound closed, without drainage.

Second admission, December 22, 1892. Similar symptoms as at previous operation of five days' duration.

Operation, December 29, 1892.—Small intestine adherent to the anterior abdominal wall at a distance of 10 cm. Long narrow band extending from a point on the descending colon to the anterior abdominal wall behind, where a loop of large intestine was caught. There was also a double volvulus of the sigmoid. This was untwisted, the band ligated and the abdominal wound closed. The patient was subsequently admitted twenty-eight times for obstruction. It has been possible in all of his subsequent attacks to relieve him by high enemata.

CASE II.—Mr. H., aged 53, admitted February 29, 1904, with symptoms of acute appendicitis and spreading peritonitis. Operation, appendectomy, irrigation of the abdominal cavity with salt solution, iodoform gauze drainage to the stump of the appen-

dix and to the pelvis. About the fourth day he began to show symptoms of intestinal obstruction and an opening was made through the old incision into the intestine. On passing the rectal-tube into this opening, an obstruction was encountered, which gave way with immediate relief to the patient. The intestine was washed out and there was no further trouble. Fistula closed spontaneously.

CASE III.—Miss F., aged 42, had been operated upon twice previously, the first operation being for ventral fixation, the second for appendicitis (chronic).

At the second operation a McBurney incision was made and a chronic appendix was removed. A few fine adhesions around the right ovary. The wound was closed without drainage. Except for a slight constipation, the patient was well for seventeen months following the second operation, then she began suddenly to have severe abdominal pain after a full meal. This rapidly became worse; temperature and pulse remained normal. The abdomen was tense and quite hard, gurgling could be heard occasionally but no visible peristalsis. There was tenderness in the right iliac fossa. No vomiting. An enema gave no results.

Operation.—Right rectus incision; 12 inches of small intestine was found black and with a very foul odor. This was produced by a loop of intestine becoming adherent by a band to the region of the sigmoid, and with this as a centre a volvulus had taken place. The lower portion of the involved intestine was 6 cm. from the ileocæcal valve. The affected intestine was resected, an end-to-end anastomosis performed, and the wound closed without drainage.

The patient made a good recovery.

CASE IV.—Mr. M., aged 28. Primary operation, appendectomy and drainage for acute appendicitis and general peritonitis. Right and left rectus incisions. Gauze drainage. Eighteen months after he developed symptoms of obstruction following a hearty meal. When seen twenty-four hours after the onset, there were colicky pains, distention, nausea and vomiting.

Operation.—The intestines were found much matted together by extensive adhesions, making it impossible to locate any definite point of obstruction. The most distended loop was brought into the wound and opened. The patient's condition

became very bad on the table and he died twenty-four hours later unrelieved.

CASE V.—Mr. D., aged 16, admitted May 15, 1903. Primary operation, appendectomy and drainage of an appendix abscess for acute gangrenous appendicitis. Six months later the usual symptoms of obstruction appeared.

Operation.—One loop of ileum was found adherent posteriorly in the region of the cæcum. Another loop had slipped under this, producing an obstruction. The adhesion was freed, the loop beneath found in good condition and the abdomen closed without drainage.

Good recovery.

CASE VI.—G. W., aged 13, admitted May, 1902. Primary operation for acute appendicitis and general peritonitis. Appendectomy and gauze drainage.

Two years later he was taken with severe pain in the abdomen, of a crampy character, which had been present two days before admission. Vomiting had been persistent; abdomen distended; pulse 100; obstipation.

Operation.—A band was found extending from the scar to a loop of small intestine, which was partly twisted around it, causing an obstruction. Two other bands were found extending from the scar to other coils of the intestine but doing no harm. These were all resected and the abdomen closed.

Good recovery.

CASE VII.—Mr. B., aged 20. Primary operation, appendectomy for acute perforative appendicitis and general peritonitis. Large amount of gauze drainage. Patient has had four or five attacks since operation similar to the present one; last one **six** months ago.

Three days before admission he was taken with sudden cramp in the abdomen in the region of the old scar. Has vomited since the onset. Pulse and temperature have been normal; bowels have moved slightly with enemata. There has been no visible peristalsis. There is some deep tenderness to the right and above the umbilicus on palpation.

Operation.—Numerous loops were found adherent one to the other. No definite point of obstruction could be found. One acutely inflamed loop was left in the wound, packed about with

gauze. Four days later an enterostomy was done at this point. One month later, a secondary laparotomy was done, but on account of the condition of the patient and the difficulty in locating the obstruction, a lateral anastomosis was made between loops above and below the mass of adherent intestine.

Good recovery.

CASE VIII.—H. H., aged 14, admitted November 12, 1905. Primary operation, drainage of appendix abscess, appendix not found. Bowels moved well after the operation. Twelve days after the operation the patient began to complain of pain at intervals in left lower abdomen. At the time of the occurrence of a paroxysm of pain, there was tenderness in this region but not between. There was slight fulness of the abdomen on the left side; visible peristalsis was present.

On the following day the patient vomited quite frequently and peristalsis was much more marked. Enemata were ineffectual. No rise in pulse rate or in temperature.

Operation.—Left rectus incision; loop of small intestine was found kinked upon itself by some adhesions which had formed between it and the wall of the old abscess cavity. These were freed and the abdomen closed without drainage.

Good recovery.

CASE IX.—Mr. W., aged 54, admitted October 31, 1904. Primary operation, appendectomy for acute perforative appendicitis and localized peritonitis; iodoform gauze drainage. Third day after operation, began to complain of distention and had some vomiting, which was relieved for the time being by stomach washing. On the fifth day symptoms of intestinal obstruction became more evident, vomiting had continued, enemata were only partially effectual, and restlessness had become a marked feature. Pulse at this time, 140.

Operation.—Enterostomy through the old wound. A large amount of fecal matter and gas was expelled and the intestine was washed out with salt solution. Following this, the patient's condition improved. Six days later the fistula closed with a return of the former toxic symptoms. Reopening the fistula resulted in almost immediate improvement.

Third operation, twenty-one days after primary operation.—A kink was found in the lower portion of the small intestine, due

to adhesions about the original wound. This was freed and the abdomen closed. Following this, however, the patient did very badly and although infused and stimulated, died twenty-four hours later.

CASE X.—Mrs. T., aged 39, admitted May 14, 1904. Primary operation, appendectomy for acute appendicitis and spreading peritonitis. Iodoform gauze drainage. The patient continued to vomit for thirty-six hours after the operation. There was a slight movement of the bowels on the second day. On the third day, however, vomiting again began and was persistent. The abdomen was symmetrically distended; enemata were entirely ineffectual; there was only a slight rise in the pulse rate.

Operation.—A distended loop was found in the old wound and opened. Irrigation into the efferent loop came out of the rectum, and it was found impossible to irrigate the afferent loop. Four hours later, under ether anæsthesia, the abdomen was opened through a left rectus incision. A distended loop was opened and the intestine emptied of its contents. It was then fixed in the abdominal wound. The patient was relieved in a short time. The enterostomy opening on the left side closed spontaneously; that on the right was closed by a lateral anastomosis five weeks later.

CASE XI.—Dr. G., aged 25. Primary operation, laparotomy for typhoid perforation and spreading peritonitis. Iodoform gauze drainage. The patient had made a good recovery, and had been sitting up for two or three days, when the signs of an obstruction began to develop. This was between three and four weeks after the primary operation. There was pain, nausea, vomiting, asymmetrical swelling of the abdomen, much more marked upon the left than on the right side.

Operation.—A band was found stretching across from the old scar to the left lateral abdominal wall, obstructing beneath it a loop of small intestine. The band was resected with relief of the obstruction.

Good recovery.

CASE XII.—Miss R., aged 24. Primary operation, appendectomy for chronic appendicitis. McBurney incision. Particular care was taken to turn in all raw surfaces and the meso-appendix. Six months later, the patient had symptoms of

obstruction while at home in a distant city. Operation at that time by a local surgeon demonstrated an obstruction in a loop of small intestine due to kinking from an adhesion to the stump of the appendix. Adhesion divided and the abdomen closed.

Good recovery.

CASE XIII.—Mr. L., aged 35, admitted February 4, 1902. Primary operation, appendectomy for acute perforated appendicitis and localized peritonitis. Iodoform gauze drainage. The patient did not do well; there was no distention, but bowels could not be moved and he suffered from constant nausea and vomiting. By the end of twenty-four hours he was vomiting almost continuously, large quantities of dark material being expelled every few minutes without effort. Lavage of the stomach afforded no relief. The face was drawn and pinched.

Operation.—A distended coil of intestine was opened through the old wound. Large amount of foul-smelling material escaped. Following this, the patient did well. Four months later, a lateral anastomosis was done to close the fistula.

CASE XIV.—Mrs. S., aged 80, admitted February 1, 1905. Primary operation for gangrenous appendix. Iodoform gauze drainage. Second operation four months later for strangulated left femoral hernia. Six years after the primary operation, the patient was seized with severe abdominal cramps, nausea and vomiting which persisted for five days. Constipation had been present during this time. There had been no fever at any time. When seen by me, abdominal distention was marked, asymmetrical, being most pronounced in the right lower and left upper quadrant. The vomitus consisted of bile-stained mucus.

Operation.—On opening the abdominal cavity, the right lower quadrant was found filled with a sticky sero-purulent fluid. At the upper portion of the incision this was slightly bile-stained. On continuing the incision up toward the costal margin, the presence of bile became more pronounced. No perforation of the gall-bladder or ducts could be found. Intestines were everywhere distended and covered with lymph. Adhesions very pronounced, especially in the right lower quadrant, where an obstruction at the ileocæcal valve was made out. The patient's condition at this time became so grave that the operation was discontinued and the abdomen closed. She died a short time later.

CASE XV.—Mr. P., aged 21, admitted August 19, 1902. Primary operation, laparotomy for typhoid perforation. Small perforation in the ileocæcal valve, closed with silk suture. Abdominal cavity irrigated with hot salt solution. Iodoform gauze drainage placed in the pelvis. The patient's condition the next day was very satisfactory; tenderness and muscle spasm over the abdomen were much less. At eleven o'clock P.M. the patient complained of abdominal pain and vomited; had slight movement of the bowels following enemata. Cramp-like abdominal pain complained of occasionally. The next morning, his condition not having improved, the abdominal wound was opened, gauze drainage removed and a distended loop brought into the abdominal wound, packed off with gauze and opened. The bowel was irrigated in both directions and a large quantity of fecal matter was washed out. The stomach and rectum were also washed out. Following this, the patient's condition seemed to improve and that night after the stomach, intestine and rectum were irrigated, the patient was decidedly relieved. This improvement continued for two days. On the following day he became worse, temperature and pulse both being elevated, and, in spite of all efforts toward stimulation, died two days later.

Autopsy showed a perforation 15 cm. from the ileocæcal valve which had been sutured but from which there had been some leakage. This, however, had been entirely walled off by adhesions which had produced a sharp kinking of the ileum at this point. There was no general peritonitis.

CASE XVI.—Mr. S., aged 40, admitted January, 1906. Primary operation, nephrotomy and drainage for hæmorrhage from the right kidney. Lumbar incision. Peritoneal cavity not opened; patient came into the hospital morning of the operation, and bowels did not move with an enema. Vomited considerably more after ether than is usual and at intervals on the following day. The next day the vomitus began to have a brownish color and slight odor. There was considerable distention but no visible peristalsis. Up to this time, an enema had been ineffectual. In the afternoon of the second day quite a quantity of fluid fecal matter came through the rectal tube. On the third day, the distention became more marked; nausea and vomiting still present, and there was visible peristalsis. The patient became very restless and the pulse more elevated. No movement of the bowels.

On the fourth day the abdomen was opened and the small intestine found everywhere distended and also the cæcum. The transverse colon and sigmoid were collapsed. Some adhesions about the hepatic and splenic flexures were broken up, but these seemed hardly enough to produce the symptoms. A distended loop of small intestine was fixed in the wound with gauze. The next day, as the patient's condition was no better, the intestine was opened, with the escape of gas but no fecal matter. Attempts at washing out the intestine were unsuccessful, as it was found impossible to pass the stomach-tube for any distance. There was some improvement for thirty-six hours following the evacuation of gas but no relief of the obstruction, and the patient died four days after the secondary operation.

Autopsy showed a pretty widespread peritonitis with the lower six inches of ileum tightly bound down by adhesions, producing a stenosis in that region.

CASE XVII.—R. J., aged —, admitted May 9, 1903. Primary operation, appendectomy for perforated appendix with extensive spreading peritonitis. Gauze drainage to pelvis and stump of the appendix. Three months later the patient returned with symptoms of partial obstruction, crampy abdominal pains and vomiting at intervals. Bowels moved only slightly with enema.

Operation.—A number of adhesions were found between the neighboring coils; no definite kinking or other form of obstruction. Adhesions freed and abdomen closed.

Good recovery.

CASE XVIII.—Mr. McL., aged 19, admitted December, 1905. Primary operation, appendectomy for appendicitis probably associated with influenza. Wound closed without drainage. The patient did well until the fifth day, when after an attempt to move the bowels with cathartics and enema he developed pain in the left side with asymmetrical distention over this area. As his symptoms were not violent, further efforts were made to relieve the bowels during the next day. On the seventh day, distinct patterns were seen in the left side. Paroxysmal pains occurred, with audible gurgling; the distention had increased.

Treatment.—The patient's hips were then well elevated; the rectum was distended with several litres of water through a

rectal-tube passed high. Vigorous kneading of the abdomen was practised. An audible gurgle was heard followed at once by copious fecal and gaseous discharge, with complete relief of symptoms.

CASE XIX.—Mr. F., aged 28, admitted August 25, 1902. The patient had a history of a previous attack of appendicitis, the last one being three weeks ago, and he came into the hospital for an interval operation. Operation.—Appendix found very adherent, running down into the pelvis. In freeing the tip a small abscess cavity was opened, necessitating the use of iodoform gauze drainage. Upon the second day following the operation he began to complain of distention and pain. Enemata have given no results; pulse slightly elevated. By the fourth day the distention was still present but the patient had had in the meantime six small stools; he has been vomiting occasionally, restlessness has been marked and the pulse has risen to 130.

Operation.—A kink in the small intestine was found near the situation of the drain; this was relieved. A loop of the ileum was then fixed in the abdominal wound, as the patient's condition was such that the operator did not feel warranted in searching for further obstruction. The patient was much shocked when taken off the table and did not recover, although the intestine was opened and washed out shortly after operation.

CASE XX.—Mrs. H., aged 46, admitted September 4, 1904. Primary operation, pyloroplasty for gastric neurosis and gastropnoia. The pylorus was slightly contracted and there was a wide scar on the anterior wall. Following the operation, the patient did badly; vomiting began shortly after the recovery from ether and persisted continuously for seven days until death. Vomitus had no odor and was usually green in color. Pulse remained rapid and weak throughout the whole period. Bowels had moved well.

Autopsy, anatomical diagnosis; partial obstruction of the duodenum and early bronchopneumonia of the left lung. Cholelithiasis, myomatous uterus. There was no leakage about the suture and no evidence of peritonitis. The stomach was moderately dilated, the duodenum considerably. To the right of the position where the duodenum passed beneath the greater mesenteric vessels it was dilated. To the left it was contracted. The sigmoid and ascending colon up to the hepatic flexure was dilated.

No obstruction at the position of the anastomosis. This finding suggests the possibility of a partial obstruction of the duodenum beneath the mesenteric vessels as a cause of death.

CASE XXI.—Miss B., aged 45, admitted September 7, 1905. Primary operation, six months ago, for a radical cure of strangulated left inguinal hernia. No drainage. Ever since the patient left the hospital, she has had some general abdominal pain, slightly more marked on the right side below the level of the umbilicus. Has had indigestion and vomiting when the pains are severe. Constipation has been a marked symptom. Upon examination, a hard mass appeared close to the surface of the abdomen somewhat to the right and disappeared with an audible gurgle.

Secondary operation.—Lapatoromy. Cicatricial stenosis was found in the small intestine where it had been caught in the hernia sac at the time of the strangulation. A lateral anastomosis was done to short-circuit this area.

Good recovery.

CASE XXII.—Miss G., aged 41, admitted May 24, 1902. Primary operation, radical cure for right femoral hernia. Following operation there was nausea and vomiting for two days. On the second day bowels moved with an enema, the patient ceased vomiting and was much more comfortable. On the fourth day vomiting began again and it was impossible to move the bowels with an enema. Pulse rose to 140. On the fifth day there was marked distention; pulse 160; vomiting had ceased. Bowels had not moved.

Operation on the fifth day.—Numerous adhesions were found about the appendix and sigmoid and lower loops of the ileum. In suturing the sac of the femoral hernia the parietal peritoneum had been pulled upon where it was adherent to a coil of small intestine and thus produced a kink.

The patient died on the table.

CASE XXIII.—Mr. F., aged 28, admitted June 1, 1905. Primary operation, six years ago, acute appendicitis. No drainage. He was well for two or three years. For the past three or four years he has complained of attacks of crampy pain in the right side, radiating to the umbilicus and right leg. The attacks varied in duration from a few hours to a few days. There is considerable belching after meals and borborygmus. No nausea

or vomiting. Attacks have increased in frequency during the last few months.

Operation.—Numerous dense adhesions about the sigmoid and lower ileum. Very dense adhesions between the omentum and anterior surface of the sigmoid. These were divided and the wound closed.

Patient made a good recovery.

CASE XXIV.—Mr. S., aged 60, admitted September 12, 1903. Primary operation, cholecystostomy and drainage for stone in common duct. Large amount of iodoform gauze was used. For the first few days, the patient did not do very well. Had more than the usual amount of pain and discomfort and pulse remained elevated. On the tenth day he began to feel nauseated and vomited. Had been slightly delirious at times. From this time until the time of his death on the forty-first day after the operation, the patient was constantly nauseated and vomited almost every day. The vomitus was clear and colorless. The bowels moved every other day.

At autopsy there was found a twist at the pylorus, making an almost complete obstruction at this point.

CASE XXV.—Mr. B., aged 44, admitted July 1, 1903. Primary operation, cholecystotomy for stones in gall-bladder, cystic and hepatic ducts. Drainage consisted of tube in common duct surrounded by large amount of iodoform gauze. Did fairly well up to the seventh day, when he began to be slightly nauseated and drowsy. Following this, he became better for about ten days, but was only able to take liquid nourishment. On the twenty-second day he began vomiting again with no relation to time of taking nourishment. The vomitus was slightly blood-stained. This condition continued up to the forty-fourth day, when he died. The symptoms were practically the same as those in the preceding case. No autopsy.

CASE XXVI.—Mrs. C., aged 37, admitted May 17, 1901. Primary operation, five months previously, for intestinal obstruction due to tuberculous peritonitis. The obstruction was found to be due to adhesions of neighboring coils. These were separated and the wound closed.

Second admission.—The patient had been well up to three weeks ago, when she began to have uneasy sensations in the abdomen and constipation became more marked. Two days ago

she had severe pain in the epigastrium, with nausea and vomiting. The abdomen became tense and hard, but there was only slight distention. During the night of the second day the vomitus became fecal. Pulse on admission, 104.

Operation.—The tuberculous process had improved markedly. The obstruction was found to be due to two bands which had caught and tightly bound a coil of intestine. These were ligated and divided and other bands which were thought might give trouble were also divided. The peritoneal cavity was irrigated with salt solution and the abdomen closed.

Good recovery.

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BACKWARD DISLOCATION OF THE SECOND CARPO-METACARPAL ARTICULATION.

BY C. B. LYMAN, M.D.,

OF DENVER, COLO.,

Professor of Surgery in the Colorado State University.

As this form of injury is an extremely rare one I desire to place this case on record. Dislocation of two or more of the metacarpals upon the carpus is not an extremely rare injury. Burk has collected the records of 24 cases of this variety, which includes dislocations of all of the metacarpals, complete, incomplete forward and backward.

Hamilton, in speaking of this injury in his work on "Fractures and Dislocations," says: "Examples of these accidents are so rare that no attempt will be made to establish systematically the causes, symptoms or treatment."

Dislocation of the proximal end of the *first* metacarpal is not an uncommon injury. Boyer reports 16 cases, 11 of which were incomplete and 5 complete. I have only been able to find record of three cases similar to the one which I have to report. One is reported by Hamilton, that of a woman aged 28; the injury was produced by a fall upon the closed hand, and he says: "reduction was easily accomplished." Humbert reports a case in a man who was driving a horse which kicked him upon the hand which was holding the reins, and he says: "Reduction was easily accomplished by traction and pressure." Roux reports a case, according to Hamilton, of this variety produced by an explosion in a mine; Stimson, in his work, refers to the same case as one of dislocation of the second and third metacarpals. Stimson reports 2 cases of forward dislocation of this bone; one of these was the result of severe pressure on the back of the bone, the other the result of a blow from a hammer upon the back of the hand. Isolated cases have

been recorded of dislocation of all of the metacarpals upon the carpus with the exception of the fifth.

Considering the fact that in my cases reduction was impossible by traction or manipulation, and from the fact that in the cases cited "reduction was easily accomplished by traction and pressure," I am led to conclude that they were in reality cases of incomplete dislocation.

The case which I have to report is that of a man, W. R., aged 26, who in getting off a railway car fell from the platform to the ground, striking upon the left-side arm and hand; there were no marks of violence upon the hand. Examination showed a prominence of the proximal end of the second metacarpal bone upon the dorsum of the hand, the outline of the end of the bone being easily made out. Traction and manipulation were faithfully used, but reduction could not be accomplished; incision was made, when it was found that we had a complete overlapping of the end of the metacarpal bone upon the trapezoid. Reduction could only be done by inserting a chisel under the end of the metacarpal and prying it down into place, which was accompanied by a distinct snap which could be plainly heard by those in the operating-room. I do not believe that reduction could have been accomplished in this case by any kind of manipulation. There was no tendency to recurrence of the deformity, as was said to have existed in one of the cases above referred to.

CORNU CUTANEUM OF THE HUMAN SCALP.

BY HERMAN L. NIETERT, M.D.

Surgeon to the Evangelical Deaconess Hospital, Lutheran Hospital.

AND

EDMUND A. BABLER, M.D.,

OF ST. LOUIS, MO.

ONE of the rarest and most curious classes of tumors to which the human organism is subject, is horns, especially multiple horns, of the scalp. In ancient times, when idolatry and superstition reigned supreme, these growths were considered symbolic of wisdom and power. In Michael Angelo's painting of Moses, two horns adorn (?) the patriarch's head. This single fact would indicate the infrequency of the anomaly even in ancient times.

Horns of the human scalp are usually single; they differ from those in animals by being non-uniform in size, shape, etc. No part of the human body is exempt from their invasion, but in perhaps half of the cases they involve the scalp. In reviewing the available literature we did not find more than two cases in which two or more separate horns appeared at the same time in an individual scalp. In no instance did we find a case in which two separate horns of the scalp were associated with a cutaneous cancer of the nose, and in which numerous sebaceous cysts of the scalp were also present, as occurred in our case.

Bland-Sutton describes (1) sebaceous horns, (2) warty horns, (3) cicatrix horns, and (4) nail horns. He regards them of not infrequent occurrence, although Crocker contends that they are very rare. In Robert's interesting case the horn grew from a wart on the cheek of a woman seventy-five years of age, while that reported by McLeod developed from the base of a wart on the chest and attained a length of two inches.

Shaw saw a patient fifty-six years of age with a cutaneous horn of the lower eyelid. Six years previous to its appearance he observed a small pimple upon the lid. A fine, hard, hair-like growth appeared on the surface and gradually assumed the appearance of a horn; eighteen months later it dropped off, leaving a pimple the same as before; later the horny growth returned and became two inches long. Whishow's patient possessed a horn which developed from a tubercle in the scalp. It attained a length of two inches. In Bellamy's patient the horn grew from the clitoris and resembled the claw of a lion. The largest horn that has been found in a human was that of Paul Rodreguez; it grew upon the side of the patient's head, and was fourteen inches in circumference, and was divided at the apex into three shafts. In the museum of the Medical Department of Washington University is a cast of a cutaneous horn of the scalp. The horn was six inches in length and grew from the forehead. The cast was brought from Paris by Dr. Pope. In Soubervielle's patient the horn was ten inches long.

Cutaneous horns have been found in mice, birds, and other members of the lower animals in which horns are uncommon. Bland-Sutton has presented a sketch of a cutaneous horn in a mouse found in Westminster Abbey. Sutton has also referred to a very interesting case of horn which grew from a scar resulting from a burn. The latter is especially interesting since Spietschka has contended that no true horn can be formed if there be no papillæ in that part of the skin.

Etiology.—It is quite certain that the true etiology depends on several factors. Most authorities are non-committal. The predisposing factor seems to be a wart, a sebaceous cyst, a scar, or a nail. The exciting factor may be a blow or anything that causes certain changes in the sac-tissue whereby horny cells are constantly produced. At any rate, we do not agree with Bland-Sutton, who holds that sebaceous horns are formed in consequence of the protrusion of the contents of a sebaceous cyst through a rupture in the cyst wall, or through

the duct of the follicle, which becomes desiccated on exposure to the air. Gross is of the opinion that horns are directly traceable to chronic inflammation, such as produced by blows, burns, etc. Lall's very interesting case adds weight to our contention. The patient, a middle-aged man, had noticed a small, hard, painless mass upon his left cheek near the angle of the mouth, eight years previous to consulting Lall; the tumor gradually enlarged and the patient consulted a barber who applied medicine; a few days later the skin over the tumor peeled off, and a small, white horn was noticed; the horn became larger and attained a length of almost three inches; the barber cut off the horn but the latter returned rapidly and in a short time was three inches long; Lall was then consulted. He found that the base of the horn involved the entire thickness of the cheek. In our case there was a history of heredity.

Pathology.—Crocker and others maintain that horns are essentially overgrown warts and that they always begin in the rete mucosum or the homologue of it lining the glands and follicles. There is always hypertrophy of the papillæ, and upon these the horn is built up, being composed of columns of epidermic horny cells, generally without nuclei. Rokitansky regards these growths to be in their nature innocent, although Paget believed that there was some relation between horns and epithelial cancer. He referred to a case of soot-cancer in which the borders of the ulcer showed spur-shaped sharp-pointed processes which he believed to be cancerous papillæ. Durken observed a patient who possessed a horn almost five inches in diameter at the base, and about four inches in length, in which the tissues at the base of the horn became ulcerated, and carcinoma developed. The daughter of Durken's patient possessed a cutaneous horn in a similar location and with the same results. Gould refers to a patient who presented a horn growing upon an epitheliomatous penis, while Pancoast observed a papillary epithelial cancer which developed at the base of horns on the face of a sea captain.

It seems quite probable that the constant irritation naturally resulting from the presence of a cutaneous horn of the scalp, etc, prepares the tissues at the base of the horn for carcinomatous invasion.

CASE.—Mrs. K——, aged 62, married, was admitted to the surgical service of the Evangelical Deaconess Hospital and gave the following history:

Family History.—Parents died of causes unknown to patient. No history of tuberculous or malignant disease in family. Mother of patient had sebaceous cysts of scalp. One sister had sebaceous cysts of scalp. Two daughters and one son of patient had similar growths. Patient is the mother of four apparently healthy children.

Previous History.—Always enjoyed good health. Twenty years ago she noticed several “lumps” in her scalp but since they caused her no discomfort and no inconvenience she gave them but passing thought. Seven years ago a small warty growth appeared upon the nose. She consulted a dermatologist, who removed it by means of an electric needle. The dermatologist suspected the growth to be a cutaneous cancer. One year after the removal of the growth, the grand-daughter accidentally scratched the area formerly occupied by the latter, thereby causing the parts to bleed. Since that time the patient has been troubled with a condition quite similar to that previous to the operation. Six years ago the patient fell downstairs striking and rupturing one of the sebaceous cysts; the latter discharged a corn-meal-like substance. Five years thereafter she noticed the presence of a hard, horny-like growth in two of the cysts. The growth in the ruptured cyst was the larger of the two. During the following few weeks she observed an offensive discharge from the base of one of the horny growths. The horns have been constantly increasing in size.

Present Trouble.—Patient comes to hospital to have growths removed, since they cause her annoyance and discomfort. They also cause her mental discomfort.

Physical Examination.—Medium-sized female; fairly well nourished; color good; pupils equal and react normally. A scaly growth, evidently a cutaneous cancer, is present upon the right



Cornu cutaneum in human scalp.



Cornu cutaneum in human scalp.

side of nose; upon the left parietal area of the scalp, just below the sagittal suture and near the coronal suture, are two horns, the larger of which is anterior; both horns are somewhat curved and have a peculiar appearance. The skin about the base of the horns has the general appearance of that observed at the base of horns in the lower animals. Three irregular and separate masses, evidently sebaceous cysts, are noted in other parts of the scalp. The general findings are of no interest. Palpation reveals the fact that the horns are superficial to the aponeurosis; movement of the growths cause the patient pain. The three masses described above are sebaceous cysts. The growth on the patient's nose is evidently superficial cancer. Further examination reveals nothing worthy of special mention.

Treatment.—The treatment of horns is simple excision. It is needless to say that complete excision of the base of the growth prevents recurrence. In our patient, the two horns were completely excised under local anæsthesia. One of the sebaceous cysts was also removed. The patient refused to permit removal of remaining cysts. Dr. Fisch examined the contents of the cyst removed. The rarity and uniqueness of the case in general have caused us to present this report.

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A SELF-RETAINING TROCAR AND CANULA FOR THE ASEPTIC EVACUATION OF DISTENDED VISCERA.¹

BY HOWARD LILIENTHAL, M.D.,

OF NEW YORK.

Attending Surgeon to Mount Sinai Hospital.

For years I have been impressed by the fact that to the operation for the relief of intestinal obstruction enterostomy adds the grave danger of peritonitis from fecal soiling. Yet enterostomy may be absolutely necessary in order to avoid the perilous handling of heavily loaded intestine, sometimes with dragging upon the mesentery to the point of rupture. No matter how carefully the enterostomy is done; even when the coils of intestine can be drawn out of the wound and incised at a dependent part or when a trusted assistant supports the puncturing trocar and canula, or when it is possible to stitch a tube into the lumen of the viscus, every surgeon knows that here even an approximation to asepsis is impossible. In these cases, too, the peritoneum is in a congested and receptive state, so that infection is hard to avoid.

This matter was recently once more brought to my notice when a death occurred soon after an operation for acute obstruction. Much time had been lost because of my efforts to make the multiple enterostomy as aseptic as possible. Greater speed would have afforded better chances of success.

With the idea of preventing infection and saving time, I devised the trocar and canula here to be described. George Tiemann & Co. have manufactured the instrument after my drawings.

Fig. 1. shows the instrument closed and ready for insertion

¹ Instrument present at the meeting of the Surgical Section, of the New York Academy of Medicine, April 6, 1906.

into the bowel. The size of the canula is 32 French, but it can be manufactured of as small a size as 28 French. The trocar (A) is of special construction, flat and double edged, so that it may be inserted with a gentle motion and without the sudden thrust required by the more usual triangular point. The handle of the trocar is at A'. The part of the canula

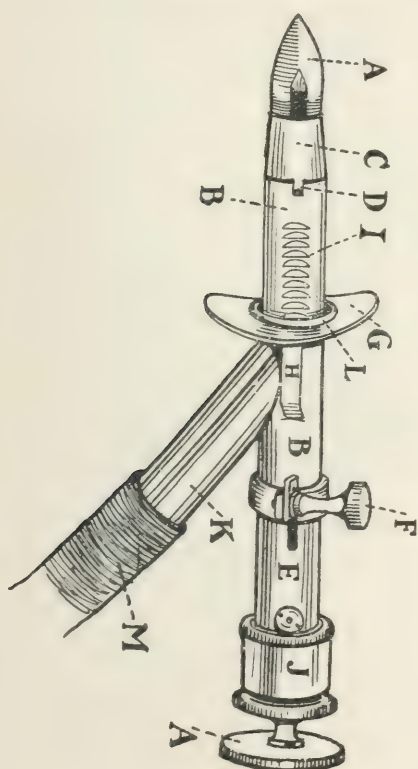


FIG. 1.

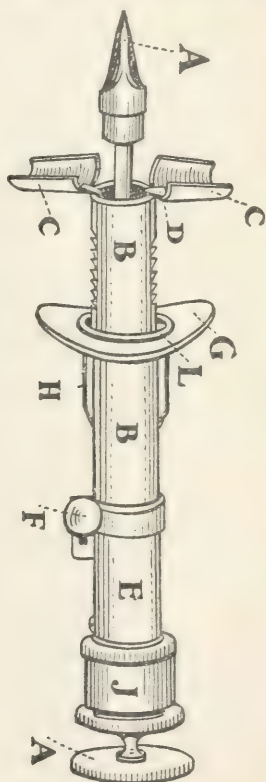


FIG. 2.

marked C is split longitudinally into two parts which swing out on hinges (D) until they make right angles with the long axis of the instrument. (See Fig. 2.) This swinging out is accomplished with the aid of a simple mechanism by pressing the sleeve E toward the point of the trocar, which can only be done after loosening the set-screw F. This screw is then tight-

ened holding the wings in position. The shield (G.) is next pushed down toward the point of the trocar until it can go no

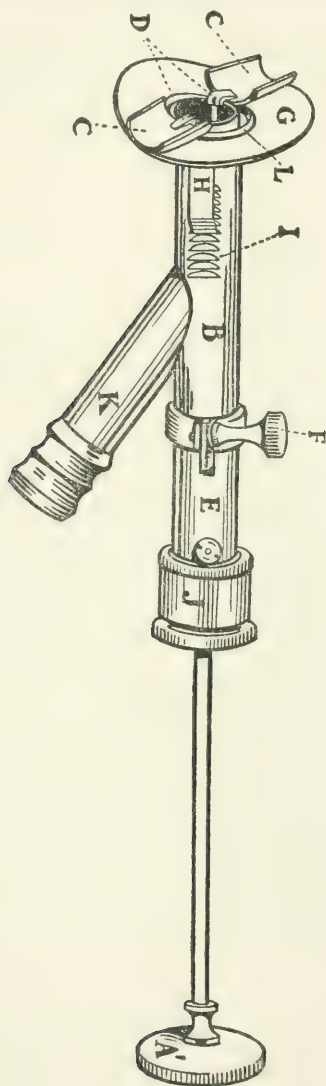


FIG. 3.

farther, being stopped by the wings (C). The intestinal wall is held firmly between the wings (C) and the elevated ring (L)

of the shield (G). The shield cannot slip back, being held by the springs (H) which catch in the notches (I). The fluid from the intestine at once begins to flow out through K, a branch of the canula, to which a rubber tube (M) has been attached to carry the septic matter to a receptacle remote from the operative field. The trocar is drawn back into the canula beyond the branch (K), thus permitting a perfectly free flow. The well-known principle of passing the shaft of the trocar through a washer (in the chamber J) has been employed here in order to prevent leakage. A little sterile vaseline spread over the trocar and the first portion of the canula facilitates introduction. When the wings have once been spread and set and the shield has been pushed down,—the work of but a few seconds,—the instrument is firmly in place and the opening in the bowel is *flush with the wall of the viscus*, a considerable advantage when the intestine begins to collapse. It is best to place a preliminary Lembert purse-string suture around the place selected for the puncture, the suture to be tightened as the canula, its wings once more closed, is withdrawn. The trocar should not be pushed home when the wings are closed for withdrawal.

Two thorough and satisfactory tests with this instrument were made by me, using a piece of dead intestine, tensely distended with water. There was no leakage. It was also employed three times in operations on the living human subject. The first patient was dying of septic peritonitis and an enterostomy was made for drainage, without a preliminary purse-string. The instrument was left in for some hours. No leakage.

The second patient had an enormously distended and greatly thickened gall-bladder. The trocar and canula acted perfectly, evacuating in a few moments about twelve ounces of pus previous to cholecystectomy. The third patient was a man with acute symptoms following chronic obstruction of the transverse colon by a carcinoma. There was enormous distention of small intestine and the first portion of the colon.

Evacuation of a gallon of fecal contents through two punctures was aseptically performed. Absolutely no leakage.

Finer points of technique will suggest themselves to the surgeon on using the instrument. For example, in small intestine it may be advisable to insert the trocar at an angle oblique to the long axis of the gut so as to avoid possible injury to the opposite wall. In cases of empyema of the gall-bladder when calculi are present it is conceivable that they may get into the canula wedging the wings apart. If these stones cannot be removed by washing them back into the viscus with a syringe at the rubber tube the instrument may be withdrawn by cutting the wall of the now empty gall-bladder. If it is desirable to wash and partly sterilize the cavity of the gall-bladder before extirpation or other operation, it may be done by lavage with antiseptics.

The writer presents this instrument to the profession with faith in its usefulness and the hope that it may often prove of service in times of great surgical need.

[April 27, 1906. The instrument has been used a number of times since this article was written and has proven itself truly aseptic. For the sake of brevity the name Visceral Evacuator is suggested.]

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, November 22, 1905.

The President, DR. GEORGE WOOLSEY, in the Chair.

SUPPURATIVE NEPHRITIS: RESECTION OF BOTH POLES OF THE KIDNEY.

DR. CHARLES L. GIBSON presented an Italian woman, 28 years old, who entered St. Luke's Hospital on September 17, 1905. She had never been pregnant, nor did she give a history of any menstrual disorder. For the past three years she had suffered occasional attacks of obscure abdominal pain. Nineteen days ago she had a sudden severe chill, with violent pain in the left side of the abdomen, radiating forward from the loin, with nausea and vomiting. A few hours later she was admitted to the Mt. Sinai Hospital with a temperature of 102.6; pulse, 104; and shortly afterward she had a second chill and a rise of temperature to 104. The leucocyte count on the following day was 9,400. Micturition was frequent and painful, and often the urine was blood-tinged and full of pus. She remained in the hospital thirteen days, undergoing a curettage and a fruitless exploratory incision of Douglas's cul-de-sac. During the past week she had passed almost pure blood, and had had frequent attacks of pain in the left lumbar and hypochondriac regions.

Physical examination showed a strong, well built woman. There were no objective signs excepting resistance and tenderness in the left lumbar region. Her temperature, at the time of her admission to St. Luke's Hospital, was 103; pulse, 112. The urine

was acid; specific gravity, 1018; it contained two per cent. of albumin and a small amount of pus. A differential count of the leucocytes showed sixty-eight per cent. of polynuclear cells, and subsequently only fifty-eight per cent.

The patient was kept under observation for three weeks before operation. She presented the picture of an acute pyæmia, with wide fluctuations of temperature, reaching as high as 106° F., together with irregular chills and marked constitutional depression. A tentative diagnosis of a calculous pyelitis was made.

Operation, October 9, 1905: A ventral incision disclosed a kidney slightly enlarged and congested, but otherwise presenting a normal surface appearance. Exploratory punctures of the kidney were negative. An exploratory incision through the convex border opened a normal pelvis, and exposed only healthy cut kidney tissue. Finally, on decapsulation, there was found at either extremity an aggregation of small miliary abscesses, in some cases confluent. These were treated by shaving off successive thin slices of the kidney until sound areas were reached.

The incision into the kidney was closed with catgut sutures. Packing was carried down to the site of the resected area.

Following the operation, there was some temporary shock, and for four days there was a temperature curve that decreased by lysis from 104.5 to 99. Then there was a remission of symptoms and temperature, followed by another week of fever, but during the patient's last three weeks in the hospital the temperature never reached 100, and was practically normal for two weeks. The wound healed well, without suppuration, and the patient rapidly regained flesh and strength, with the disappearance of all her former symptoms.

On November 18, when her urine was last examined, it had a specific gravity of 1020 and contained neither albumin nor pus.

The sections of kidney tissue removed were submitted to the pathologist, who reported that they showed a suppurative nephritis.

DR. GEORGE WOOLSEY mentioned a somewhat similar case that had come under his observation last summer. The patient was a man, who, upon his admission to the hospital, had a high temperature, and examination showed a tender mass, which could be readily palpated, and corresponded to the lower pole of the

right kidney. Upon exposing that kidney, the lower third of the organ was found to be much enlarged and studded with numerous small abscesses or necrotic areas. The lower third of the kidney was resected and the organ sewed up. The pathologist reported that the case was one of suppurative nephritis, staphylococcus being found. The man made a good recovery, but still had a small sinus when last seen.

Dr. Woolsey said that Dr. Brewer had reported a number of cases of suppurative nephritis in one of which death had occurred after a conservative operation, and where Dr. Brewer thought a more radical operation would probably have given a better result.

ANEURYSM OF THE SECOND AND THIRD PORTIONS OF THE RIGHT SUBCLAVIAN ARTERY; PROXIMAL AND DISTAL LIGATION.

DR. JOSEPH A. BLAKE presented a man, forty-three years of age, a native of Vermont, who was admitted to the Roosevelt Hospital on May 10th, 1905, with an aneurysm of the second and third portions of the right subclavian, and the first portion of the axillary arteries.

The causation was obscure. He had never had syphilis. His occupation, a worker in a creamery, necessitated the throwing of heavy cans of milk upon a wagon, and he attributed his trouble to this work.

The symptoms had been chiefly pain from pressure on the brachial plexus, and had been noticed for eight months. The pulsating tumor was first noticed three months before admission.

Examination revealed a fairly well nourished muscular man, with a rather poor color. The heart was slightly enlarged and there was a blowing systolic murmur at the apex. The second aortic sound was sharp and ringing. There was no difference in the radial pulse. The arteries were tortuous and somewhat thickened. There was a visibly pulsating tumor just above the inner third of the right clavicle, and in the apex of the axilla. The tumor projected about an inch above the contour line of the neck. Marked expansile pulsation was felt in both locations. The tumor above the clavicle was the size of a large hen's egg, while the axillary one was the size of a pigeon's. A distinct

systolic bruit was heard above the clavicle and in the axilla. There was no evidence of interference with the recurrent laryngeal nerve. The carotid also appeared to pulsate more fully than normal.

Operation, May 18, 1905; nitrous oxide-ether anæsthesia. Incision was made down the outer border of the sternomastoid muscle to the clavicle, and then out along the clavicle. The clavicular attachment of the sternomastoid and the omo-hyoid were divided. The sac was exposed with its relations, and was found to involve the artery from the inner border of the scalenus anticus to the axillary. Its greatest transverse diameter was about two and one-half inches.

The first portion of the subclavian was not enlarged; neither was the carotid or innominate. The phrenic, pneumogastric and recurrent laryngeal nerves were recognized and retracted. It was then apparent that a ligature could be passed about the first portion without great difficulty. Accordingly, a large aneurysm needle with No. 4 chromicized gut was passed from without inward under the artery, the gut being doubled about the vessel. The double ends were tied in a single square knot, and again separately. The ligature was drawn tight enough to stop the pulsation but probably did not crush the intima. The muscles were then sutured and the wound closed without drainage. Union occurred by first intention.

There was slight pulsation in the sac the next day and still more the second day, which continued until the second operation, although the radial pulse on the right side never became as strong as on the left. His pains also returned, but were localized to the distribution of the ulnar nerve.

Second operation, June 14, 1905; about four weeks after first operation. The first portion of the axillary was ligated through a muscle splitting incision in the pectoralis major. The artery, where ligated, was about $1\frac{1}{4}$ inches in diameter. The aneurysm needle was passed with some difficulty on account of the dilatation of the vessel. A double loop of No. 4 chromicized gut was passed through the single loop, which was then withdrawn, thus passing four strands about the vessel. These were ligated separately, being drawn tight enough to completely obliterate the vessel.

The ligature was placed high, about the aneurysm itself, in order to avoid interference with the branches of the axillary artery. This precaution was well taken, since the circulation in the extremity has been none too good since the operation. The wound healed by first intention. The sac became firm and gradually contracted. There has been no return of pulsation in the sac or radial artery.

The patient is now, four months after the last operation, perfectly well. The circulation, however, in the right arm is poor and the finger nails show disturbances of nutrition.

According to König, the right subclavian has been ligated twenty times, with one recovery, the deaths being chiefly due to secondary hemorrhage. According to Sheen, the innominate artery has been ligated thirty-six times, with seven recoveries. Thirty-four of these cases were for aneurysm of the subclavian. In such cases, ligation of the common carotid is also necessary.

Considering the high mortality of ligation of the common carotid, it would seem that, when feasible, as in the present case the first portion of the subclavian should be ligated, followed if necessary by ligation of the upper part of the axillary.

If the ligature does not divide the intima, there is little danger of secondary hemorrhage; there is also little tendency to clot formation, and consequent plugging of the carotid.

DR. HOWARD LILIENTHAL said that last spring he showed a very similar case, in which he had ligated the first portion of the right subclavian and right common carotid for a sacculated aneurysm of the third portion of the subclavian.

In connection with that case, Dr. Lilienthal said, he had reviewed the literature on the subject, and he had been surprised to learn how frequently the subclavian had been ligated in its first portion. The subclavian and innominate, either together or separately, had been ligated about a hundred times: the subclavian and carotid, together, had been ligated at least ten times; probably oftener. The mortality following ligation of the subclavian had markedly diminished since 1890, having fallen, in the one hundred cases he had collected, from seventy-five per cent. to sixteen per cent. The probabilities were that the older operation did not succeed on account of the ligation having been done in the old-fashioned way, cutting through the inner coats of the artery, whereas the safer Ballance-Edmunds knot was now used.

In any future case of this kind that might come under his care, Dr. Lilienthal said, he would be inclined to try the Matas operation, which he regarded as perfectly feasible in dealing with a sacculated aneurysm in this region.

DR. CHARLES H. PECK mentioned a case recently seen at Roosevelt Hospital in which the aneurysm involved the first part of the subclavian and probably extended downward into the innominate. Dr. Brewer ligated the common carotid and three weeks later Dr. Peck ligated the third portion of the subclavian. A Ballance-Edmunds knot was made, and the suture material was heavy silk. The patient made a good recovery from the operations, but at the time he left the hospital, while the aneurysm had shrunk somewhat, it was not cured. The patient had since been lost track of.

GERSUNY OPERATION FOR INCONTINENCE FOLLOWING PROSTATECTOMY.

DR. HOWARD LILIENTHAL presented a man, fifty-nine years old, who was operated on two years ago by another surgeon at the Mt. Sinai Hospital for the relief of prostatic hypertrophy. The suprapubic operation was done, and the prostate removed, and Dr. Lilienthal had been assured that no part of the urethra was removed at that time. The wound healed without any trouble, but subsequent to the operation the man found himself unable to urinate. This necessitated a perineal section, when it was found that the deep urethra seemed to be obliterated. The section went straight through what seemed to be scar tissue into the bladder, and this passage was subsequently kept open by sounds. The patient finally recovered with complete incontinence, for which he had to wear a urinal.

Six weeks ago, when Dr. Lilienthal operated on the patient to relieve the incontinence, he found the perineal urethra apparently perfectly normal. It was dissected out without the slightest difficulty, and cut across about an inch in front of the anterior layer of the triangular ligament: it was then twisted about 300 degrees, anchored to the triangular ligament, and the cut ends of the urethra united by suture.

The immediate result of the operation was absolutely perfect. The patient, who had always had a small bladder, was able to

hold four ounces of urine for several hours without any difficulty, and only got up twice during the night to urinate. Furthermore, he had perfect control over the act of micturition, and could begin and stop at will. Four days ago, however, dribbling of urine was again noticed, and the speaker said he was inclined to attribute it either to atrophy of the scar, or to the fact that the urethra was becoming untwisted.

Dr. Lilienthal said that Dr. Charles A. Elsberg, who witnessed the operation, had suggested at the time, but after the cutting of the urethra, that it might have been better not to cut the urethra but to twist it as a whole, to make a double sphincter. In any future operation of this kind, the speaker said, he would be inclined to act upon that suggestion, not opening the urethra at all, but simply dissecting it out, twisting it and then anchoring it.

The perfect control that this man had over his bladder immediately after operation tended to confirm the theory of those physiologists who held that the compressor urethræ muscle controlled the urine at will, and only gave way during the act of micturition, but that the deep sphincter gave way before micturition. In this case, the operative work was done in front of the triangular ligament, and yet the function of micturition was perfectly restored for a time.

SECONDARY ABSCESS FOLLOWING APPENDECTOMY FOR GANGRENOUS APPENDICITIS.

DR. LUCIUS W. HOTCHKISS presented a man, twenty-three years old, who had been operated on by Dr. Hotchkiss at Roosevelt Hospital for gangrenous appendicitis on July 23, 1905. The operation was done at the end of the second day of the disease. A gangrenous appendix was removed, a large abscess evacuated, the pelvis washed out through a small McBurney incision, and a cigarette drain inserted. Although the patient made a good recovery from the operation, his convalescence was very stormy, and was characterized by vomiting during the first three days, and by abdominal distention and colicky pains, which necessitated the steady use of the rectal tube and various enemata. There was a profuse and, at first, a foul-smelling discharge from the wound, which later became simply purulent, and then ceased. The abdo-

minal pain and the distention continued, and were only partially relieved by enemata. The temperature ranged between 99 and 101 F., and never quite fell to normal. At the end of the third week there was an attack of coming, with marked distention. No mass could be felt at any time until about the end of the third week, when the patient noticed a swelling on the right side of the scrotum, which was the seat of a reducible inguinal hernia. This swelling increased and became painful, and showed evidences of an abscess in the hernial sac. This, in connection with his previous condition, was thought to be part of a peritoneal pus collection higher up, and preparations were made for an immediate operation.

On August 11, nineteen days after the appendectomy, the second operation was done, and fecal smelling pus was evacuated from the sac of the hernia in the scrotum. After thorough cleansing, the hernial sac, which was thickened and infiltrated, was removed. Its neck was found to be occluded by adherent omentum. The inguinal canal was closed after the Bassini method, and a small drain inserted. A laparotomy through the left rectus was then done, and the peritoneal cavity opened. The omentum and intestines were found adherent anteriorly to the abdominal wall, and had shut off several abscesses of different size in the pelvis. These were evacuated, and the pelvis thoroughly washed out and drained. The cigarette drain was replaced on the sixth day by a rubber tube on account of the profuse discharge, which became fecal on the following day. This fistula continued to discharge profusely for several days; then the discharge gradually diminished and finally ceased in about five weeks, when the patient left the hospital in excellent condition.

Dr. Hotchkiss thought the case somewhat remarkable from the fact that the hernial sac was involved by gravity in the intra-peritoneal suppuration, and also because a radical cure of the hernia was apparently effected under the somewhat adverse conditions that were present. The speaker said he had seen several cases of secondary abscess following appendicitis, and thought the recognition of such a condition most important.

DR. JOSEPH A. BLAKE said that some years ago he saw a woman over sixty-five years old who was suffering from what was supposed to be a strangulated femoral hernia. The protrusion

was tense and tender. The abdomen was found to contain pus, and the case proved to be one of peritonitis, originating from a gonorrhœal salpingitis. The patient made a good recovery after abdominal lavage and removal of the infected tube.

DR. WOOLSEY recalled a case operated on by the late Dr. Hall at Roosevelt Hospital in 1886, where a supposed strangulated hernia proved to be a tubercular abscess in the hernial sac, extending into the lower abdomen. The removal of the appendix in this case was the first of the kind in the United States.

CARCINOMA OF THE STOMACH.

DR. CHARLES N. DOWD presented a young woman, of twenty-four, who stated that her digestion had never been good, starchy food being particularly disturbing. About two years ago she began to have pain in the right hypochondrium, and to vomit frequently. The vomitus was blood-stained a few times, but there was never marked hæmatemesis. The pain was often so severe that she caused herself to vomit to relieve it.

In the latter part of the spring of 1905 her discomfort was so great that she was unable to attend to her ordinary duties. On examination, a movable mass, about two by four inches in size, and very tender on pressure, could be felt just below the margin of the ribs at the right of the epigastrium, and could be pushed upward under the border of the ribs.

Operation, June 7, 1905. The mass was found to be an adeno-carcinoma of the greater curvature of the stomach, involving both the anterior and posterior walls, and situated just to the left of the pylorus. A partial gastrectomy was done by the method described by Mayo. The stomach was divided across just to the right of the median line, and the duodenum just at the border of the pylorus. The edges were inverted with chronic gut sutures, and a posterior gastrojejunostomy was done with the aid of a Murphy button, the upper part of the jejunum being used.

The patient made a rapid recovery, the button was passed on the twentieth day, and she left the hospital on the thirty-third day. In less than two weeks after her discharge from the hospital, the patient, who was a trained nurse by profession, was able to take charge of a severe case of illness. She has gained almost forty pounds in weight.

The interesting features of this case, Dr. Dowd said, were the age of the patient (twenty-four years), the presence of a movable mass which could easily be felt and its location in the greater curvature of the stomach instead of at the pylorus. The stomach was found to be firmly adherent to the pancreas, which, according to Mickulicz, renders these cases particularly unfavorable, his mortality rate being about seventy per cent. when this condition was present. Dr. Dowd said he had found the operation described by Mayo comparatively easy, and there was absolutely no tension following the anastomosis, and in that respect it was an improvement on the Kocher operation.

DR. HOTCHKISS said he shortly expected to report in detail a case of carcinoma of the stomach in a young man, twenty-four years old, the same age as the patient shown by Dr. Dowd. This young man had been in the enjoyment of reasonably good health, when he had a sudden attack of gastric pain, with vomiting. He then began to lose flesh, and upon examination, a large, movable tumor in the upper part of the abdomen was discovered. Upon operation, the tumor was found to involve the posterior wall of the stomach, the lesser curvature and the pylorus to some extent. A partial gastrectomy was done and the patient made a good recovery.

DR. JOSEPH A. BLAKE said that in two cases of carcinoma of the stomach that had recently come under his observation, an analysis of the stomach contents showed, respectively, one hundred and twenty per cent. and seventy per cent. of total acidity. The amount of free hydrochloric acid was also excessive, showing the unreliability of this symptom in the diagnosis. In neither of these cases was there palpable tumor. In both there were obstructive symptoms, and both were regarded as cases of chronic ulcer of the stomach. At operation the growths were so extensive that pylorotomy was out of question.

DR. ALEXANDER B. JOHNSON said that some years ago he operated on a boy, not over fifteen years of age, with a massive carcinoma of the stomach which involved almost one-half the great curvature. The tumor was found inoperable after the abdomen was opened.

DR. WOOLSEY said that the statement made by Mikulicz, to which Dr. Dowd had referred, that strong adhesions between

the stomach and pancreas greatly increased the operative mortality in these cases had led him on one or two occasions to abandon the idea of resecting the stomach. Of course, where the adhesions did not cover a large area or were not very firm, it was perfectly justifiable to go ahead and take the risk.

CARDIOSPASM: WITH REPORT OF AN OPERATIVE CASE.

DR. JOHN F. ERDMANN read a paper with the above title (for which see page 224).

DR. LILIENTHAL said that these cases must be extremely rare, and probably, if they were common enough, an instrument could be devised which would accomplish exactly what was necessary, and without the dangers which Dr. Erdmann had mentioned. If the condition could be remedied by a non-operative method, it should certainly be preferred to an operation. A device which might possibly prove serviceable in these cases was the rubber bag that was quite commonly used for the purpose of dilating the cervix uteri. It was covered with a spool-shaped silk covering and if it could once be introduced into the cardia it could be inflated without danger of lacerating the tissues and there would be no possibility of rupturing the rubber.

DR. ERDMANN said that in the case reported by Straus, to which he had referred in his paper, the cardiospasm was treated by means of an inflatable rubber bag attached to the distal end of a stomach tube. The ultimate outcome of that method was still in doubt, as the cases in which it had been resorted to were of very recent occurrence.

ŒSOPHAGEAL TUBE FOR USE DURING NARCOSES.

DR. WILLY MEYER showed an instrument designed by Krausch for the purpose of obviating fecal drowning during operations for intestinal obstruction.

DR. ROBERT H. F. DAWBARN commented favorably upon the ingenuity of the device shown by Dr. Meyer. He added, however, that for those who might not wish to buy all new contrivances if they could make others do the same work,—and particularly in discussing material of such comparatively short life as rubber,—the same good purpose of preventing fæces from passing during operation up the œsophagus from the stomach might

be accomplished by the use of Dr. Syms' perineal prostatic retractor. Of course, it was a convenience in the device shown by Dr. Meyer that it was hollow from end to end, and through it one might finally wash out the stomach. However, on removal of the Syms' retractor, a stomach tube could in a few moments be passed in its place, and do the same work of lavage.

CONGENITAL HYDRONEPHROSIS.

DR. ERDMANN showed a specimen, which was removed from a child three months old. The circumference of the child's abdomen prior to the operation was $21\frac{1}{2}$ inches, and immediately after the operation 13 inches, and the weight of the child fell from fourteen and a half pounds to nine and three-quarter pounds. The only history obtainable was that the child was born with considerable difficulty on account of the presence of an immensely enlarged abdomen. The operation was done three weeks ago and the patient made an uneventful recovery.

Stated Meeting, February 28, 1906.

The President, DR. GEORGE WOOLSEY, in the Chair.

PERFORATED GASTRIC ULCER; GENERALIZED PERITONITIS.

DR CHARLES H. PECK presented a woman, 23 years of age, who was admitted to Roosevelt Hospital, service of Dr. R. F. Weir, late in the evening of December 17, 1905, with the following history: She had been troubled with indigestion for a long time, and about two years ago had vomited some blood. There had been no especial exacerbation of symptoms of indigestion up to 6 o'clock the afternoon before admission, when she was suddenly seized with violent epigastric pain, vomiting and collapse. There was no blood in the vomitus. The pain continued, and distention of the abdomen increased steadily up to the time of admission.

On admission, the abdomen was found greatly distended; tenderness and rigidity were general, but greatest in the upper

half of abdomen. On percussion there was complete absence of liver dulness; tympanitic note all over front of abdomen with shifting dulness in the flanks; no fluid wave detected; facies anxious; respiration rapid and shallow; pulse, 138, small and thready. No leucocyte count was made. A diagnosis of perforated gastric ulcer was made, and the patient was immediately prepared for operation.

Operation at 11 P.M., 29 hours after the onset of symptoms of perforation. Ether anæsthesia.

A median incision made above the umbilicus; on opening the peritoneum, there was a gush of gas and turbid fluid. Thick flakes of recent lymph covered the anterior aspect of the stomach, and the adjacent surfaces of the liver and surrounding peritoneum. Some delay was caused by searching for the perforation in the region of the pylorus before it was finally located about midway between the greater and lesser curvatures on the anterior wall, not far from the centre of the anterior aspect. The perforation was large enough to admit the little finger. The surrounding stomach-wall, for a radius of nearly an inch, was thickened, infiltrated and friable. The perforation was closed with silk mattress-suture, placed with some difficulty, owing to the friability of the surrounding stomach-wall, and a few silk Lembert stitches effected an imperfect inversion of the area. The peritoneal cavity was then rapidly flushed with salt solution through the large Blake tube. Purulent fluid, flakes of fibrin, and particles of food were washed from every part of the peritoneal cavity (excepting the lesser sac), including the sub-diaphragmatic space. Large quantities were removed from the pelvis and both flanks; the abdominal cavity was unusually long and capacious. The gall-bladder and liver were normal.

Two large cigarette drains were placed down to the site of the perforation, between the anterior surface of the stomach and the under surface of the liver, and excepting at their point of exit; the abdominal wall was closed by layers with catgut, chromic gut, silkworm and silk. Time of operation, 34 minutes; patient's condition very poor.

The patient rallied well under stimulation; the bowels were moved by an ox-gall enema at the end of 48 hours, and the symptoms of peritonitis gradually subsided. There was little

or no vomiting after the operation, and the temperature subsided gradually, but the pulse remained persistently high (115 to 130) for more than a week. The drains were first removed on the sixth day, and replaced by smaller ones. There was a rather profuse discharge from the drainage-tract for about two weeks, but there was never any escape of food or gas. There was some late infection in the muscular planes, which subsided without incident. Milk feeding was commenced at the end of forty-eight hours, and soft solids in about ten days. Convalescence was somewhat slow but progressed favorably, and at the time of the patient's discharge from the hospital, on January 24, 1906, while still weak, her condition was very satisfactory. The wound was entirely healed, excepting a shallow sinus at the point of drainage. A small abscess developed in the abdominal wall about three weeks later, but healed without incident.

TRAUMATIC ANEURISM OF THYROID AXIS.

DR. CHARLES H. PECK presented a boy, 14 years of age, who was admitted to Roosevelt Hospital, service of Dr. R. F. Weir, on January 12, 1906, with the following history: On New Year's Eve, 12 days prior to admission, he was stabbed in the neck with a tin horn. He was brought to the hospital at once in the ambulance, suffering from shock and hæmorrhage.

There was a small lacerated wound ($\frac{1}{4}$ in. long) about $1\frac{1}{2}$ inches above the centre of the right clavicle, which bled profusely, and there was an extensive ecchymosis in the surrounding region. The wound was dressed, and he was kept in the ward for two days for observation. The hæmorrhage was easily checked by pad pressure and bandaging. Condition rapidly improved, and he left the hospital with the wound healing cleanly, rather widespread ecchymosis, but no paralysis, nor evidence of nerve injury or pressure, symptoms which were carefully looked for as the point of injury was over the brachial plexus. He returned to the accident ward for dressing every day or two; the wound healed by first intention, and the ecchymosis subsided, but he began to complain of pain in the shoulder and upper arm. On January 12, the day of admission, he returned, complaining that the pains were increasing and that the arm was weak.

On examination, a pulsating tumor was found beneath the



TRAUMATIC ANEURISM OF THYROID AXIS.

a, Sternomastoid; divided and reflected. b, Scalenus anticus; divided and reflected. c, Internal jugular vein. d, Subclavian vein. e, Common carotid artery. f, Subclavian artery, showing ligatures on first and third portions. g, Thyroid axis, forming stalk of aneurismal sac. h, Transversalis colli artery, ligated and divided. i, Brachial plexus. j, Phrenic nerve. k, vagus. l, Aneurismal sac; dotted lines indicate where sac was laid freely open at outer and inner aspects. m, Clavicle. n, Omohyoid.

lower part of sternomastoid, projecting beyond its posterior border, and anteriorly to its anterior margin. The upper limit could be fairly well defined, and was $1\frac{1}{2}$ to 2 inches above the clavicle; the lower limit could not be defined, extending down to the clavicle. Pulsation was expansile and strong. There was marked inequality of the pupils, that of the injured side being contracted, indicating pressure on the sympathetic nerve. There was a partial paralysis of the upper-arm muscles, most marked in the deltoid, caused by pressure on the brachial plexus. He was admitted to the ward for observation. During the following thirteen days, up to the time of operation, the symptoms did not materially change, excepting that the tumor increased slightly in size. The paralysis of the arm also increased slightly, but the pain remained about the same. The inequality of the pupils persisted. There was no inequality in the radial or temporal pulses.

Operation, January 25, 1906, under ether. A V-shaped flap was dissected back, its anterior margin following the lower half of the anterior border of the sternomastoid, and its lower margin the clavicle. The external jugular vein was doubly ligated and divided; the sternomastoid was divided transversely about one inch above the clavicle, and reflected in both directions. The phrenic nerve was exposed on the anterior aspect of scalenus anticus, dissected free from it, and lifted forward with the internal jugular vein. The vein was then separated from the vagus and the carotid, and drawn outward. This exposed the anterior aspect of the inner part of the aneurismal sac, and below it the first portion of the subclavian artery, separate from the sac. A double safety ligature of heavy floss silk was passed around the artery. The third portion of the artery was then exposed external to the scalenus anticus, and a similar safety ligature placed at this point. By careful blunt dissection and retraction of the scalenus anticus, the entire artery was exposed; it was normal in size and appearance. Above it, and in direct contact, lay the aneurismal sac; passing from the artery directly into the sac was the short stem of the thyroid axis. Passing from the sac outward, the transversalis colli artery was seen. It was doubly ligated, and divided. An attempt was then made to pass a small, sharply curved aneurism needle around the thyroid

axis, close to the main vessel,—*i.e.*, between it and the aneurismal sac, but in spite of great caution, the sac, a false one, was ruptured in the attempt. Hæmorrhage was profuse; the safety ligatures were at once tightened, but only partly controlled the bleeding. The sac was torn into on its outer margin, and a finger thrust in, controlling the return flow from the branches by direct pressure. The safety ligature on the first portion of the subclavian was then tied with the double strand, Ballance-Edmunds knot; the other safety was replaced by a single strand of silk, tied on the second portion of the artery distal to the thyroid axis. The scalenus anticus was then divided transversely, and reflected, exposing the anterior aspect of aneurismal sac thoroughly. Pressure with the finger within the sac was kept up continuously, severe hæmorrhage occurring the moment it was removed. Attempts to secure the bleeding point through the outer opening in the sac failed, and gauze packing also failed to control it. The internal jugular vein was retracted outward, and the sac laid freely open on its inner border; clots were cleared out, and after long effort the principal bleeding point in the upper wall of the sac was secured by a clamp, which was left in place. The remainder of sac was packed with sterile gauze from both outer and inner sides to control the remaining hæmorrhage. The sternomastoid was sutured with chromicized catgut, the skin with silk. No attempt was made to suture the scalenus anticus. An intravenous saline infusion of 1000 c.c. was given on the table. Time of operation, $2\frac{1}{4}$ hours; condition fair. The aneurismal sac was a false one; posteriorly it lay on the prevertebral muscles; its lower margin extended down to and slightly behind the beginning of the innominate, and the first and second portions of the subclavian; its outer margin lay on the cords of the brachial plexus; the upper margin was beneath the origin of the scalenus anticus; the phrenic nerve and the internal jugular vein crossed the centre of the sac.

The patient reacted well from the shock and hæmorrhage. There was a sharp reaction of temperature to 103.4 in the first twenty-four hours, after which it never rose above 100. The radial pulse was first felt at the right wrist on February 4, the tenth day after operation. On February 5, the eleventh day after operation, the clamp was removed, and the gauze packing

withdrawn from the sac from both inner and outer sides. There was no hæmorrhage. A small rubber tissue drain was placed in the anterior opening, and all stitches were removed. The wound healed without infection, and is now completely closed, excepting for a small granulating defect at the anterior drainage point and one at the point of flap, where a small area of skin necrosed. The patient was allowed out of bed on the twentieth day after the operation. At the time of his discharge from the hospital, the paralysis of the arm had begun to improve slightly, but the pupils were still unequal.

At the present time, February 28, 1906, the paralysis has entirely disappeared from the arm, but there is still some inequality of the pupils. The pain in the arm disappeared shortly after the operation.

TYPHOID PERFORATION.

DR. JOSEPH A. BLAKE presented a man 38 years old, who was admitted to the medical service of the Roosevelt Hospital on November 1, 1905, in the estimated seventh day of a relapse of typhoid fever. On admission, his temperature was 103.6°; pulse, 90; respiration, 24; leucocytes, 14,600, Widal, negative. From the seventh to the thirteenth day, temperature varied from 102° to 104°; pulse 96 to 120. On the tenth day, the leucocytes were 8,000; the differential, 77 per cent. of polymorphonuclears. On November 8, the fourteenth day of the relapse, his temperature dropped at noon from 103.4° to 99°; the pulse from 100 to 88; the respirations to 20. This was followed by a severe chill at 5 P.M., with rise of temperature to 104°; pulse 104; respirations 24. He complained of some pain, referred to the umbilicus. There was slight distention, a good deal of rigidity and some general tenderness. At midnight he was asleep and comfortable; at 3 A.M. he complained of some abdominal pain on drinking a glass of water; at 6 A.M. there was some distention, marked board-like rigidity, general tenderness, and absolute loss of liver dulness. Temperature 98°; pulse 100; respirations 24; leucocytes 15,300; differential, 79.6 per cent. polymorphonuclears.

When Dr. Blake saw the patient that morning, he advised immediate operation, which was done under nitrous-oxide-ether anæsthesia. The incision was made in the median line, just above

the pubes, on account of the maximum tenderness being at that point, and of the fact that by the rectum an indefinite fulness was felt in the pelvis. A diffuse sero-purulent peritonitis extending to the transverse colon was found, and the belly contained free gas. The pelvis contained coils matted together by a fibrinous and purulent exudate, together with considerable fecal matter. One of the coils of the ileum, lying at the bottom of the pelvis, exhibited a single perforation about 4 mm. in diameter. This was closed by a silk purse-string and reinforced by a continuous silk suture. No other perforations or thinned portions needing suture were found. The mesenteric glands were considerably enlarged. The abdominal cavity was thoroughly irrigated with the double current irrigator, and the wound closed with a cigarette drain reaching to the bottom of the pelvis. Time of operation, 23 minutes.

In this patient, the perforation had evidently occurred at 12 o'clock noon on the day before; that is, just 24 hours before operation, and had caused a local pelvic peritonitis. Six hours before operation it had burst its confines and spread, giving rise to the characteristic signs of peritonitis. The location of the perforation in the pelvis was responsible for the slight symptoms at first, the marked improvement in the earlier symptoms having been undoubtedly due to the slow absorption that occurs in pelvic inflammations. The after-course was characterized by a fair recovery at first, but with continued suppuration from the wound, with no tendency to heal. On the fifty-first day after operation the sinus was explored, under ether, and a quantity of dirty granulations from a deep pocket in the pelvis were curetted out. After this procedure, his convalescence was steady, and he was discharged on the seventy-second day, with a small granulation at the site of drainage.

CEREBRAL CONTUSION; OPERATION.

DR. JOHN A. HARTWELL presented a boy, ten years old, who was admitted to the Lincoln Hospital February 4, at 2 P.M., with the history of having fallen a distance of 20 or 30 feet, and landing on his head and shoulders. No one actually saw him fall, so that it was impossible to get accurate data on the above points. He was brought to the hospital in the ambulance in a condition

of considerable shock, and partial coma. He could be aroused with difficulty; surface cold and pale; temperature 99.2; pulse 120 and weak; respiration, 32. There was no paralysis. Pupils were dilated. No localizing symptoms of any sort could be made out. Examination of the head showed an extensive hæmatoma over vertex and left parieto-frontal region. No evidence of fracture could be made out under this hæmatoma. There was no bleeding from the ears, mouth or nose, nor any subconjunctival hæmorrhage. The child was put to bed and the usual remedies for shock, including rectal irrigations and morphine, were given. In the course of an hour the shock had considerably lessened, and the coma was less deep. He continued to recover from the shock, but the coma again deepened, and the irritability, on being aroused, was becoming excessive. No coördinated response could be elicited in any way. He resented very markedly any manipulations, or any effort to make him answer questions. He failed to recognize his father.

All the reflexes were markedly exaggerated, but no paralyses or anæsthesiæ could be made out. His condition was diagnosed as one of severe cerebral concussion, with progressing paralysis of the cerebral vessels, and beginning œdema of the brain. Under ether anæsthesia, two hours and a-half after admission, incisions were made over the hæmatomata, and the skull explored; no evidence of fracture could be found. It was determined to open the skull for the purpose of exploration. Accordingly, the temporal muscle on the left side was exposed along its origin, its fascia turned back by a semilunar incision, and the fibres separated vertically, according to the method advocated by Cushing. A one-inch trephine opening was then made at a point one and a-half inches above, and one inch in front of the external auditory meatus, exposing the dura; this was seen to be dark in color, very tense, and without pulsation. No extra-dural hæmorrhage was found. The skull was rongeured away in all directions, making an opening of about $2\frac{1}{2}$ inches in a longitudinal by 2 inches in a vertical diameter. The same condition of the dura was present in this whole area. A small opening was then made in the dura, and blood-tinged cerebro-spinal blood spurted out to the distance of about 3 or 4 inches, thus showing the pressure under which it existed. The dura was then cut away

over the whole surface from which the bone had been removed, exposing the brain beneath; the brain did not pulsate, the small superficial blood-vessels were dilated to three or four times their natural size, and the blood in them was of a dark, venous color. There was no actual trauma of either the vessels or the brain-tissue itself apparent. In the course of three or four minutes the pulsation in the brain gradually returned; the blood-vessels became much less prominent, and the blood in them became of an arterial color. Coincident with these changes, the condition of the patient's pulse and respiration was closely watched, but it could not be determined that any change took place, the pulse rate remaining from 110 to 120. The temporal muscle, which had been retracted antero-posteriorly during the manipulations in the skull and brain, was now allowed to fall together again, and was tacked with three or four catgut sutures; the temporal fascia was carefully sutured along the curved section with catgut, a small drain being left down to the brain-tissue. A copious dry dressing was applied to the wound. The child recovered from his anæsthesia without incident, and in the course of 3 or 4 hours was entirely conscious with practically no symptoms of cerebral irritation. He gave the details of his injury, and told his name and address. His convalescence was uneventful; the wound healed *per primam*, and the pulsation beneath the temporal covering of the brain has been present ever since. There is no tendency for any increase in the size of the cerebral protrusion, but on the other hand, a decrease. Immediately after the operation, and during the following days, it was as much as one-half to three-quarters of an inch above the skull level. It has gradually lessened, until now its maximum is only one-quarter of an inch, and palpation shows it to be less tense than it was two weeks ago. It would have been better to have made an osteoplastic flap, but no instrument for this was at hand, excepting the gouge and mallet, which, under the existing conditions, would have been exceedingly dangerous from the continued jarring necessitated. An attempt to leave the dura *in situ* and re-suture it failed because of the great tension, and the subsequent gradual subsidence of this tension shows that a replacement of this dense membrane would have continued to an excessive intracranial compression, and defeated the very object of the operation. The uncovered

brain is a "silent area," and it may be hoped that the pericranium will develop enough thickness and firmness to protect it.

The conditions which determined operation on this boy were rapidly increasing coma and cerebral excitability, with the strong belief by all those observing him that he was developing the very condition found,—namely, a vasomotor, paralytic cerebral œdema, which would inevitably prove fatal if not relieved. The absence of localizing symptoms left no other course than to produce a de-compression of the brain, and thus combat the loss of tone in the cerebral vessels.

Subsequent Note, March 5, 1906.—The protrusion of the brain has entirely subsided, and given place to a depression one-half inch below the scalp; that is, to its normal level.

DR. GEORGE WOOLSEY said he had done a somewhat similar operation in a case of tumor of the brain for the same purpose as proposed by Dr. Cushing, although in his own case he did not split the temporal muscle, as he wanted more room. The operation was comparatively easy, although it simply disclosed an increase in brain pressure. A needle was inserted into the lateral ventricle, and about six drams of fluid withdrawn. The man made a prompt recovery from the operation, and the very severe headache, from which he had previously suffered, disappeared. He was also practically totally blind and deaf; the former symptom was unaffected by the operation, but there was slight improvement in the deafness. The operation was justifiable in cases where the brain lesion could not be localized, and where there were indications for relief from brain pressure.

FORWARD DISLOCATION OF THE CARPUS.

DR. IRVING S. HAYNES presented a man, 35 years old, who was admitted to hospital on January 30, 1906. The history he gave was that last September, while working at a wire-machine, his right hand was caught in a loop of wire and severely twisted. After the accident, he was treated for a time at the dispensary.

Examination showed a scar one-quarter of an inch wide across the back of the wrist. The lower end of the radius was considerably thickened, but the styloid process seemed to be in its normal relation to that of the ulna. There was a complete forward dislocation of the carpus, without lateral displacement.

The movements of the wrist were fair, and those of the fingers were normal, but he complained that the hand tired easily. An X-ray negative showed a forward dislocation of the carpus, and apparently an indistinct line of fracture of the radius about one inch above its lower end, with slight tilting backward of the lower fragment. In other words, it looked like an old Colles' fracture, with dislocation of the carpus in addition.

On January 31, 1906, under ether anæsthesia, reduction was attempted by manipulation, but this proved impossible. The joint was thereupon exposed through lateral incisions; an examination confirmed the above findings, and showed, in addition, that the carpus lay in a shallow depression in front of the radius. The first row of carpal bones were removed singly, and reduction was then easily accomplished. A through-and-through drain of a dozen silkworm-gut strands were inserted, and the wounds sutured. A plaster-of-Paris dressing maintained the hand in an over-corrected position. The drainage was removed on February 2, and the patient was discharged five days later.

An examination on February 28 showed that the position of the carpus was good. There was excellent motion in the wrist and fingers, considering the short time that had elapsed since the operation, and the continued use of the splints. The incisions healed without incident save in one small spot.

HYPERTROPHY (FIBROADENOMA) OF THE BREAST.

DR. IRVING HAYNES presented a photograph and specimen, removed from a girl of thirteen years, who was admitted to hospital on January 26, 1906.

In April, 1905, it was noticed that both breasts began to enlarge. They were a little painful on pressure, but this symptom soon disappeared. The breasts were almost equal in size, the right one being perhaps slightly larger than the left until last September, when the latter began to enlarge very rapidly. Menstruation, at that time, had been established a year ago, and was regular.

Examination showed that the right breast covered the area from the second to the sixth ribs, and from the anterior axillary line to an inch and a-half from the sternum. It was firm, and



FIG. 1.—Fibro-adenoma of breast.

while considerably larger than usual for a girl of her age, it did not show any evidences of abnormal growth.

The left breast was very large, reaching to the ilium when the patient was standing (Fig. 1.). A record was not made of its length and circumference, but after removal it weighed exactly eight pounds. The nipple was flattened, and the region about it excoriated. Sensation over the area was diminished. The breast was freely movable on the deeper structures; it was not painful, and only inconvenient by reason of its weight and size. The axillary glands were not enlarged.

On January 30, 1906, under ether anæsthesia, the breast was easily and quickly removed. The wound healed by primary union, and the patient left the hospital on February 13. Dr. Rogers, pathologist to the hospital, reported that the growth was a fibroadenoma undergoing mucoid degeneration.

In addition to the hypertrophy of the breast, the girl had a fibrous growth of the gums of the right side of both the upper and lower jaws, in which the teeth were nearly buried. This growth had existed since childhood; it was not painful, it did not bleed, and had been very slow in its development.

DR BLAKE said the condition of the girl's gums recalled a case of symmetrical hypertrophy of the gums which came under his observation about three or four years ago. On looking up the subject at that time, he found that the condition was a rare one. The microscope showed a dense, fibrous hyperplasia of the tissue of the gums, and suggested some defective nerve influence. The condition was analogous to what he had observed in hypertrophy of the bones and tissues of one side of the face.

THE DIAGNOSIS AND TREATMENT OF TYPHOID PERFORATION.

DR. GEORGE WOOLSEY read a paper with the above title (for which see page 652).

DR. JOSEPH A. BLAKE said he thought it was a reproach that more of these patients did not come to operation. His own experience with typhoid perforation was limited to eight cases, with four recoveries. In regard to the diagnosis and the indications for operation, Dr. Blake said he agreed essentially with Dr. Woolsey. He mentioned one case which he saw in con-

sultation with Dr. Peck last fall where there was pain and a trifling amount of rigidity; an operation was advised, but the attending physician decided to wait a little longer and the patient eventually recovered without an operation. In that case there were undoubted signs of peritonitis, probably from deep ulcerations, and an operation would perhaps have been the least dangerous plan of treatment.

Rigidity, Dr. Blake said, was not a very reliable symptom in typhoid perforation, although sometimes it was pronounced. Pain was the most important symptom, but the fact should not be lost sight of that the sensorium of these patients was oftentimes clouded. In operating, the speaker said, he had always employed general anæsthesia, and made his incision in the lower part of the rectus. In some of his cases, he had closed the wound without drainage; in these, there had not been much exudate left in the abdomen, and they did as well or better than those in which drainage was employed. He had always irrigated freely with large quantities of saline solution.

DR. JOHN A. HARTWELL reported the case of a friend not under his own care where during the third week of typhoid there was hæmorrhage from the bowels, with vomiting, and sudden pain in the right lower quadrant of the abdomen. Rigidity was not marked. Upon opening the abdomen, there were evidences of peritonitis, with considerable exudate, which was just becoming purulent. No perforation was found. Drainage was established and recovery ensued.

In a second case occurring in the service of Dr. Adrian V. S. Lambert, at the Lincoln Hospital, the woman gave a history of having been ill for five or six weeks. She had had fever and pain in the abdomen, and was bedridden, but the exact nature of her illness had not been determined. Upon examination, a tumor was made out in the region of the appendix, and she was operated on under the impression that the case was one of appendicitis. Upon opening the abdomen in the usual site for such operations, a large abscess was evacuated, but the appendix itself could not be found. Shortly after this operation, the patient developed a fæcal fistula which failed to heal, and after five or six months the abdomen was again opened through the old scar, and several large perforations were found, one in

the caput coli, and the others in a coil of the ileum at some distance from the ileocæcal junction. The nature of these perforations suggested that they were due to some ulcerative condition. The appendix, apparently perfectly normal, was found lying behind the cæcum, and it had evidently not been the cause of the previous trouble. The case, was reported as possibly one of typhoid fever, with ulcerations through the cæcum, though the indefiniteness of the early history made the diagnosis necessarily uncertain.

DR. WOOLSEY, in closing, in discussing the subject of peritonitis without perforation, said it was a well established fact that adhesive peritonitis did occur, and he had seen cases where omental adhesions covered an ulcerated Peyer's patch. In a case shown at a meeting of the Society some years ago by Dr. F. Tilden Brown, in which recovery had taken place after perforation, the result was partly attributed to the fact that the omentum had become adherent over the ulcerated Peyer's patch, and had acted as a trap-door, so that very little exudate escaped into the peritoneal cavity. In that case, the wound was closed without drainage. Such a condition would also account for the so-called cases of perforation that recovered without operation. This subject had given rise to a good deal of controversy, and while some held that the mortality of typhoid perforation without operation was 95 per cent., others claimed that it was as high as 100 per cent. Osler is reported to have never seen a recovery in such a case. In those cases where recovery occurred, there was probably a certain degree of peritonitis, but without perforation.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, February 2, 1906.

The President, DR. D. A. K. STEELE, in the Chair.

ŒSOPHAGEAL POLYP REMOVED BY OPERATION.

DR. W. R. CUBBINS (by invitation) reported a case of œsophageal polyp removed by operation, and exhibited the specimen. The patient was 45 years of age, married; occupation, roofer. He had been previously healthy; he gave no history of any disease. He was the father of ten children, seven of whom were living. During the administration of an anæsthetic for the reduction of a dislocated shoulder joint the patient vomited, and during this act the tumor was extruded from the mouth, and was grasped and measured, so that it protruded four inches outside the mouth. He wanted to remove the tumor, but the patient's wife objected and insisted on his returning it, and it was swallowed back. After this it was necessary to anæsthetize the patient again for another operation, and several attempts were made to remove the polyp by introducing a forceps down through the œsophagus, but were unsuccessful. Shortly after this the patient began to develop symptoms of obstruction. These were not severe at first, but at the end of three months obstruction was so marked that he was unable to take anything except liquids. Solid food was ejected unchanged. The tumor seemed located at the sternal notch. For over half an hour it was impossible to get fluids up or down. Patient could neither vomit nor swallow. At the end of three-quarters of an hour the tumor seemed to pass down, so

that the patient was again able to swallow water or milk and other liquid food. He had become very much emaciated when he appeared the second time. He was now prepared for an operation on the neck, and attempts were made to nauseate him, so that he would throw up the tumor. His stomach was filled with water; he was given some apomorphia, but no fluids would come up. He was, therefore, anæsthetized, but attempts made to draw the tumor from the throat failed. Dr. Wm. E. Schroeder and the speaker then did a lateral œsophagotomy, after having located the œsophagus with stomach-tube, and they found the tumor situated on the anterior portion of the œsophagus, with the pedicle a little to the left of the median line just above the larynx and cricoid cartilages and extending down into the œsophagus for about seven inches. It was ligated and removed, and the wound closed, with packing. The tumor measured sixteen centimetres in length, just above the lower end it was rather cone-shaped, and was five centimetres, in diameter and at the pedicle one centimetre. It weighed 210 grams. The lower end was eroded when they removed it. When it was first extruded, six months before, there was no erosion at the lower end.

In looking up the literature the reporter had found the best article on the subject had been written by Minski, of Dorpat, who had gone back to 1687 and had brought the literature down to 1887. The first case was seen by von Heys, who tried to get rid of the tumor by brushing it, and in so doing excited inflammation which killed the patient. This article was exceedingly interesting from the fact that it was printed in five languages, Latin, French, German, English, and Swedish.

They found three cases reported in which the tumor was removed by the mouth. The tumor had been thrown up and held until it was clipped off, the pedicle ligated, and returned. The other tumors were diagnosed at autopsy. The patients had symptoms of obstruction during life. The tumors were located at different places in the œsophagus, from the upper portion of the larynx down to the middle portion. Some extended down as far as the pylorus (?).

These tumors had been described as steatomata, but the more recent ones as fibromata, with large amounts of fat. The microscopic slides showed large amounts of fat. To look at the tumor

one would not suspect fat. In some portions there were small accumulations of lymphoid tissue.

Monroe in 1763 described the case of a man who vomited a four-prong fleshy tumor, with one pedicle. He was allowed to swallow it again, and after seven or eight months died of starvation. Monroe, Jr., described another case of the same type in 1797.

In the microscopic sections described by Professor Minski they found that the description fits the tumor they had removed exactly, with the exception that the œsophageal mucosa was very much more marked, and the papillæ were more marked in their sections than in the illustrations which he gave. But the fibrous tissue, arranged in layers, was very prominent, with a fatty layer in between, and with only one portion that looked like a clear fibroma in the specimen which upon section showed lots of fat.

In the bibliography they found the only trouble with the voice was when the tumor involved the larynx by traction on the mucous membranes pulling back upon the arytenoid cartilages.

DR. B. W. SIPPY read a paper, by invitation, entitled "Diagnosis of Œsophageal Lesions," (for which see page 858).

DR. WILLIAM E. SCHROEDER said as to the operation for the removal of the œsophageal polyp they succeeded in getting hold of the tumor with a pair of forceps and in putting a clamp on it, but were unable to deliver it. He thought this was fortunate in a way, because there were large vessels in the pedicle of the tumor. An external œsophagotomy was finally performed and the tumor fished out with the finger; the pedicle was clamped above and below, sutures applied to the pedicle first, and the œsophagus closed with Czerny-Lembert sutures, and the wound packed.

If these tumors lay deep down, as they did at times, in the thorax, he thought it would be difficult to remove them. Even with the œsophagoscope it was hard to see how one could grasp such a pedicle at such a long distance through the œsophagoscope.

As to trauma of the œsophagus, about eight years ago a recent graduate decided that it was necessary to wash out his brother's stomach. Accordingly, he procured a soft stomach-tube, and proceeded to introduce it. The patient, a young man twenty years of age, expressed great pain immediately the

tube came to the cardiac end of œsophagus, and the fluid was passed in. The case came to post-mortem in short order. It was found that there were no pathological changes in the lower part of the œsophagus, but that the tube had perforated the œsophageal wall and the left thoracic cavity was filled with water. Microscopical examination showed the œsophagus was perfectly normal; the stomach was normal, and the patient was normal in every sense of the word. He had eaten something which did not agree with him, and he thought it was the proper thing to have his stomach washed out. Here was a serious accident following a simple procedure.

DR. LOUIS GREENSFELDER said the swallowing of foreign bodies, such as fish-bones, small particles of chicken-bones, etc., not infrequently caused abrasions of the mucous membrane of the œsophagus and produced œsophageal abscesses.

Another point was the occurrence of typhoidal ulcers at the lower portion of the œsophagus, which Dr. Sippy omitted to mention.

DR. DANIEL N. EISENDRATH asked whether the œsophagoscope was absolutely necessary in the diagnosis of œsophageal lesions? Also, whether it was not sufficient to use the various forms of bougies and bismuth, with the use of the X-ray, etc., in making an ordinary diagnosis of œsophageal lesions? He asked whether any microscopical examinations had been made in these cases of cardiospasm. He asked whether the administration of large quantities of bismuth in these cases and of getting an X-ray shadow of this spindle-shaped dilatation would not be a great aid?

He presented to the Society about two years ago a young man who had specific stenosis of the œsophagus. He was very much emaciated, and œsophageal bougies were arrested at about the level of the bifurcation of the bronchi. X-ray with the aid of bismuth was used, and the X-ray showed that the bismuth was arrested at about the level that the bougie was. Autopsy showed that there was no diverticulum, as was thought possible at the time, but there was œsophageal stenosis of specific origin, as was originally thought from a distinct history of syphilis.

DR. SIPPY replied that the chief value of the œsophagoscope was for the removal of foreign bodies. There it became indispen-

sable. A foreign body firmly lodged in the œsophagus constituted a very serious condition; unless removed it sooner or later caused the death of the patient. The early use of the œsophagoscope for the removal of a foreign body must be strongly urged. During the first day or two, after a foreign body had lodged, there was very little inflammation present, but after three or four days or a week, inflammation became intense; abscess formation occurred; perforation of the wall of the œsophagus was likely to take place, and above all, after a short time inflammation surrounding the foreign body made it difficult to extract. So whenever a foreign body was lodged in the œsophagus in an inaccessible position, which could not be pushed down or brought up, the œsophagoscope should be used at once, and in a great many cases, not in all, the foreign body could be extracted.

As to the use of the œsophagoscope in the diagnosis of lesions, relatively little aid was obtained by using this instrument in the diagnosis of diverticulum of the œsophagus. At times it was possible to see the communicating point between the œsophagus and diverticulum, but one usually saw only a pouch.

As to its value in differentiating cicatricial stenosis from carcinoma of the œsophagus, in most cases a diagnosis could be made without the use of the œsophagoscope, but there were cases in which a good deal of difficulty might be encountered, and in all instances the œsophagoscope was likely to render diagnosis more positive. He had said in his preliminary remarks that there was great danger in assuming that carcinoma was present when obstruction existed. If one looked at the obstruction and found a nodular, ulcerated, or sloughing mass, the diagnosis of carcinoma would be greatly strengthened thereby. The instrument was certainly of value in cases that were not absolutely plain.

In differentiating cicatricial stenosis from cardiac-spasm, the œsophagoscope he considered of value because usually the funnel-shaped stenosis produced by the cicatricial narrowing was quite different from simple muscular contraction at the lower end of the œsophagus. In most cases a differential diagnosis could be made fairly certain without the use of the œsophagoscope, but there was no question that one was much more certain after using the œsophagoscope than without it.

In answer to Dr. Eisendrath's question, he said that micro-

scopical examination had been made when cardiospasm was present. Various theories had been advanced as to why idiopathic dilatation of the œsophagus occurred. Mikulicz and Meltzer brought forth the idea of primary spasm of the cardia. Rosenheim believed that atony of the wall of the œsophagus or primary weakness of the wall of the œsophagus was responsible for the development of the dilatation in certain cases. The proper tonus being absent, rapid eating caused undue filling of the œsophagus, resulted in sacculation and the lodgement of food; the accumulation of food irritated the wall of the œsophagus, which was likely to result in secondary spasm of the cardia.

Kraus advanced the theory that degeneration of the pneumogastric nerve was a cause of idiopathic dilatation of the œsophagus. Normally, the closure at the cardiac orifice was under the influence of two forces, one the contraction of the circular fibres of the œsophageal muscle; the other an inhibitory force which caused relaxation of the cardia under the influence of swallowing and vomiting. Fibres from the pneumogastric supplied the impulse that relaxed the cardia. Other fibres of the pneumogastric supplied the peristalsis of the œsophagus. Disease of both sets of fibres resulted in a removal of the relaxing force governing the cardia, and at the same time caused weakening of the peristalsis of the œsophagus. A paretic œsophagus and unrestrained contraction of the cardia would readily result in œsophageal dilatation. Kraus found degeneration of the pneumogastric nerve in one case. Klebs found fatty degeneration of the muscle. Round-cell infiltration of the muscle-wall had been found in cases associated with œsophagitis.

Forcible dilatation was the best method of treating cardiospasm. The passage of bougies had been followed in a number of cases by good results, but if dilatation of the œsophagus had occurred, such results were usually only temporary. It was impossible by passing a bougie to stretch the orifice, because one could not get in a large enough bougie to produce actual stretching of the muscular fibre. In many cases, if there was inflammation of the sac, when the bougie was passed it irritated the œsophageal wall, and spasm was increased by passing the bougie. This was true in the case spoken of by Dr. Graham. In this case any attempt made to pass the bougie was followed by greater spasm.

Other means had been devised to stretch the cardia. Rosenheim and others resorted to the use of rubber bags that were introduced to the seat of stricture, and filled with air or water. When the rubber bag was distended with air or water, expansion of the rubber took place at the point of least resistance, which was downward into the stomach, and upward into the dilated œsophagus, so that insufficient pressure was exerted at the point where the greatest stretching was required. This, however, did more good than the passage of bougies. Rosenheim resorted to this method successfully in one or two cases. Mikulicz did a gastrostomy in a case which was approaching inanition, hoping that by putting the œsophagus absolutely at rest the spasm would be relieved. After a period of two or three years, no influence having been exerted upon the spasm, he cut into the stomach and forcibly dilated the cardia with an instrument on the order of a uterine dilator. The symptoms were relieved. He operated subsequently on three other cases, and, according to the last reports, the results were good. Since then other surgeons had adopted the same means.

Dr. Sippy mentioned the manner in which he treated the case referred to by Dr. Graham, and two other cases.

He had constructed a dilator which consisted of a rubber bag, about three and a-half inches long, encased in a silk bag, which limited accurately the distention produced. When inflated with air the circumference of the silk bag was 15 cm. The dilating force was accurately controlled by the silk bag, and the maximum pressure exerted at the point desired. The bag was introduced and held in position by a bougie. When collapsed and surrounded by a condom to prevent friction, the greatest diameter of the instrument was about half that of an ordinary stomach-tube. By altering the size of the silk bag any degree of dilatation desired could be readily accomplished. No anæsthetic was required, and the serious operation of Mikulicz was obviated. In the case referred to by Dr. Graham the œsophagus held 500 c.c. For three months previous to using the instrument the patient had been unable to take nourishment except through a stomach-tube, by means of which she was fed four times daily. The bag was used twice, and the obstruction was at once relieved. Since then he has dilated two other cases. One was a student

of the University of Illinois, whose œsophagus held 400 c.c. His trouble had lasted for three years, during which time he had lost a great deal in weight. In another case one dilatation was sufficient to relieve the symptoms for a period of six months. After a drinking bout there was a slight return of the spasm, and dilatation was again performed, with complete relief. One could readily see how the œsophagus might vary in size, and that a greater degree of dilatation might be required in one case than in another. It was possible to dilate the cardia efficiently and accurately without resorting to gastrostomy.

PANCREATIC CYST.

DR. EDWARD H. OCHSNER exhibited some concretions removed from a pancreatic cyst. The patient presented a tumor in the left hypochondrium, which caused no special discomfort, except that it was slightly tender on pressure and alarmed the patient because of its presence. The patient had very thick abdominal walls, and although the diagnosis could not be made positively a probable diagnosis of pancreatic cyst was made. At the operation a cyst was found containing 700 c.c. of straw-colored fluid and three softish, irregular, yellow concretions, pea-sized and slightly larger concretions.

In conjunction with this case he presented a trocar which he had used in withdrawing this fluid without spilling a drop. He said there were many similar trocars on the market, the only difference between this and the others being that this always worked, while the others rarely ever worked after they had been boiled three or four times. The reason why this trocar always works is because both the tube and the stilet are made of gun-metal and are made with the same care and in the same manner as an ordinary all-metal syringe, while the ordinary trocars on the market depend for their vacuum-producing power upon packing, which is ruined by a few boilings. The instrument exhibited had been used for four years, boiled with all the other surgical instruments probably a thousand times, and is working just as well to-day as it did when perfectly new. The instrument was originally described in the May, 1903, number of the ANNALS OF SURGERY.

DIAGNOSIS AND TREATMENT OF COXA VARA.

DR. JOHN L. PORTER read a paper entitled as above.

DR. WALLACE BLANCHARD had come to the conclusion that much confusion could be avoided by classifying these cases as false and true coxa vara. One class of cases that would come under the head of false coxa vara Dr. Porter had not mentioned, and that was the coxa vara of infantile rickets, and these cases would be frequently seen. In the last five years they had had twelve cases of coxa vara from infantile rickets at the Home for Crippled Children. These cases were pronounced in every instance. The patients stood with a marked tilting of the body, but walked without limping. Skiagrams in several of these cases showed deflection downward of the neck and depression head of the femur. Adult cases of coxa vara, with a history of the condition having existed from childhood, should be classed under the head of the false coxa vara of infantile rickets. Again, under the head of false coxa vara he would place all cases of sudden onset—those cases that came on with sudden pain. He believed they were all cases due to traumatism. They were either cases of epiphyseal separation or of fracture, more or less impacted.

A case of Dr. Greensfelder's was presented to the Society a month ago, which in the speaker's opinion was a clear case of impacted fracture of the neck. The head and neck were deflected downward, but there was a distinct fracture line. He would put all cases of impacted fracture in which a skiagram showed fracture, all cases of epiphyseal analysis, and all cases with sudden onset of pain, and any history of traumatism in which deformity came on suddenly, along with cases of infantile rickets, under the head of false coxa vara.

Then it was essential to give the conditions under which true adolescent coxa vara existed. The process was one of years. At first it was imperceptible. The patient or his friends would notice a slight limp. A year later they were sure that the patient limped in walking, and two years later there would be a distinct shortening of half an inch or more, and in the succeeding five or six years there would be a gradual increase. This was the case with the patient who had bilateral coxa vara, and whom he had exhibited at a previous meeting. Commencing at seventeen, the patient now being twenty-one, the condition had gradually

increased. Abduction deformity in one year had increased about ten degrees in one hip. In the other hip the neck was about horizontal. True adolescent coxa vara was a gradual, almost imperceptible, remoulding of the neck and a gradual depression of the head. In Dr. Blanchard's case the diphtheria, which the patient had at the age of seventeen, probably had the effect of weakening bone structure, so that it failed to carry the weight of the body and gradually there was a remoulding under pressure. A weak epiphysis occasionally happened. He had a case of epiphysealysis about two years ago in a Grattan osteoclast, and the patient was still under treatment. He expected at the time to do a supracondyloid osteoclast. He had made something like two hundred supracondyloid osteoclasts, in which the epiphysis had an opportunity to separate, but this was the only case he had had in which it had occurred. He felt that weak epiphyses would occasionally occur, and he supposed those separations occurred in the hip the same as they did in the knee. Dr. Porter had shown one such case. Cases of separation of the epiphysis of the head of the femur should be classed under the head of false coxa vara.

Dr. Porter had said truly that cuneiform osteotomy relieved the adduction deformity and was an ideal operation; but the same question came up here that arose at the last meeting, and Dr. Porter had not answered it. Dr. Blanchard had recently presented a patient to the Society whose case had been progressing for five years, and in whom adduction deformity had increased about ten degrees, and shortening had increased in both legs, undoubtedly because of more depression of the head than obtained years ago. At what stage in the disease in such a case were we justified in doing cuneiform osteotomy? Dr. Blanchard said that his patient was ready for an operation at any time. If he did a cuneiform osteotomy and the disease was progressing as it had progressed for five years, while he thought he might get a good result from the osteotomy, he would lose that result completely in two years. The question arose, and was yet unanswered, When could we perform osteotomy on a progressive case with a result that would remain permanently good? This question he had not settled in his own mind, and said it was an open one, and when the various forms of false coxa vara were excluded

and the cases were simmered down to the one class of true adolescent coxa vara, which were slowly progressive, the question of operative procedure was of vital importance to the patient and of great concern to the surgeon.

DR. LOUIS GREENSFELDER remarked in regard to a case of coxa vara which was presented to the Society for him by an interne two months ago, that it presented the aspects clinically of the cases shown by Drs. Blanchard and Porter. The patient sustained a slight traumatism; but was able to be up and around, with slight limp. Nothing further was noticed for six months, when deformity was observed. This deformity was progressive for one year after it was first noticed. When the patient was exhibited to the Society it was two and a-half years after the injury, one year after the deformity was noticed.

DR. PORTER referred to rachitic coxa vara in infancy. Whitman had called attention to the fact that a slight bending downward of the neck due to a rachitic affection of the joint in infancy passed unnoticed, because of the relatively shorter and thicker head and thick tissues about the hip. In fact, it was hard to distinguish a slight affection of the hip-joint in a child, and they oftentimes walk without a limp. When a patient reached the age of thirteen to fifteen, the slight bend in infancy resulted in an increasing strain upon the joint, and the rachitic distortion of the neck in infancy might be the determining cause of greater depression of the neck in adolescence. Up to the time Dr. Blanchard began his investigation of rachitic joints with the X-ray, recognition of these rachitic bends at the hip in children was not made. We were very much at sea as to when the disease starts. In Dr. Blanchard's case the disease seemed to be progressing. Dr. Senn had reported one case which began at the age of thirty-nine, and was forty-two when distortion was recognized.

As regards osteotomy, he did not see why a patient would not be just as well off with the leg abducted in a splint or plaster-of-Paris cast after osteotomy of the femur, because the femur in healing would be in better relation to the axis of the neck, and when the operation was completed, when union took place, the normal angle of the neck to the shaft would be practically restored, which, in a measure, precluded further development

of the deformity. He was rather inclined to think that it was not poor surgery to operate upon these cases when the neck of the femur was bent in a boy, 18 years of age, on the supposition that as he grew older his tissues were going to get older, and he had a better chance of restoration of the normal axis than in trying to get well with the weight still borne at an acuter angle than normal, with greater strain on the neck.

Dr. Blanchard's case was the first one in which diphtheria was mentioned as being the possible determining cause. He did not see why any of the infectious diseases occurring at that time of life might not be a determining cause.

Referring to Dr. Greensfelder's case, in which he (Greensfelder) said the patient sustained a slight traumatism, which was followed later by deformity, he would say the epiphysis separated, but that it did not separate completely; it simply allowed the neck to slide down on the inner side, and there was constant inflammation and an attempt at restoration of function was kept up, and Whitman had pointed out that the neck was very apt to bend beyond the epiphysis where the softest part of the neck is. In Dr. Greensfelder's case he did not see why a slight traumatism should not be the true determining cause of coxa vara, a true bending of the neck, and why should we try to differentiate these cases from other cases so far as the diagnosis and ultimate function of the member were concerned? Any kind of traumatism in a boy might develop separation of the epiphysis, because of the tremendous strain that came from the bending of the neck downward, and finally there was a pushing off, with the same condition developing as in the case of Dr. Greensfelder and his own at the start.

SINGLE KIDNEY IN MEDIAN LINE WITH TWO URETERS.

DR. D. A. K. STEELE reported the case of a man, 32 years of age, who presented himself with a history of stomach trouble, nausea, vomiting, and some distress for a period of three years. About three months before he came under Dr. Steele's observation he developed a direct inguinal hernia. In two or three weeks a similar hernia appeared on the opposite side. Patient came for the purpose of an operation to be cured of his acquired direct double inguinal hernia. He was sent to the West Side Hospital

and prepared for operation. When the patient was under the anæsthetic and Dr. Steele was ready to begin the operation for hernia, in running his hands over the abdomen just below the umbilicus, he discovered a somewhat kidney-shaped tumor. This tumor was freely movable from side to side, and painless. He examined the patient before he was anæsthetized, and there was no pain on pressure. The tumor was located below the umbilicus a little more to the right than to the left. Before doing the hernia operation he made a slit over the tumor and opened the abdominal wall and found that the tumor was retroperitoneal. It was kidney-shaped and apparently was a kidney. He slipped his hand up under the right kidney region and found no kidney there. There was nothing below the liver on the right side, only an empty space. There was a central tumor slightly movable, but it had no very great amount of excursion. The thought then occurred to him that as this was a kidney in the median line perhaps it had always been there; it might have found a new dwelling-place. He examined the left side for the left kidney, and found no kidney there. The man had this single, rather large kidney, which apparently had always occupied the position in the median line. The question arose whether the man had two ureters or one ureter. He thought for scientific purposes he had carried the examination far enough. He closed the wound in the abdominal wall without deciding that point definitely, thinking it could be decided later on by the introduction of catheters and by taking a skiagraph. He did a herniotomy, and a couple of weeks afterwards, when the man was convalescent and about ready to leave the hospital, he invited Dr. Kreissl to use his illuminating apparatus, cystoscope and ureteral catheters, and to examine the bladder to see if there were two ureteral openings leading into the bladder, and to introduce, if possible, metallic ureteral catheters, so that a skiagraph could be taken and determine whether there was one or two ureters. Dr. Kreissl did so. Some difficulty was encountered in introducing the cystoscope, on account of a small meatus and moderately tight urethral stricture. Under cocainization, without a general anæsthetic, the bladder was explored and two ureteral openings were found. The cathether was introduced on one side with some difficulty, and then an attempt was made to introduce a

second catheter, which would only enter the ureteral opening, but would not go in more than three-quarters of an inch. The man complained of considerable pain, from the stretching of his urethra, and they desisted without taking a skiagraph at this time. Dr. Steele arranged for a subsequent examination three days later, and was ready to make it, but the man objected, and said that he would leave the hospital if he were subjected to another such examination. Dr. Steele declined to see him for two or three days, but before he left the hospital the patient sent word that he was anxious to have another examination. He made another appointment with Dr. Kreissl, who, he said, would give the result of the second examination to the Society.

Dr. Steele exhibited the skiagraphs that were taken following the second examination by Dr. Kreissl.

DR. F. KREISSL said the case reported by Dr. Steele illustrated the great value of the combination of sounding the ureters and of photographing the metallic sounds in position, or the combination of catheterization and radiography, as originally devised by A. B. Johnson, New York, in 1899, and almost simultaneously by Loewenhardt, in Berlin. It also demonstrated the weak points of intravesical segregation of the urine.

He was called to see a case by Dr. Cuthbertson to catheterize the ureters for a functional test of the right kidney, because he (Cuthbertson) had found a very large tumor of the left kidney, and wanted to remove this kidney. He passed the cystoscope and found only one ureteral opening on the right side. He passed the catheter in the ureter and took sectional samples of the urine. At about two inches above the ureteral orifice, he got a slightly cloudy urine, which contained pus. After passing it four inches up the ureter he got clear urine. He could not see another ureteral opening. In this case there was no ligamentum inter-uretericum. He left an ordinary catheter in the bladder and the ureteral catheter in the pelvis of the kidney for three hours, collecting six ounces of urine from the ureteral catheter and none from the bladder. It seemed then that there was only one kidney, and that an operation could not be done. Dr. Kreissl then suggested leaving the catheter *in situ* and, after injecting bismuth emulsion through the catheter, having an X-ray picture taken. If then a shadowgraph showed a shadow to the left side, one

would be almost sure there was only one kidney and one ureter. The shadowgraph showed the ureteral catheter in position on the right side up to the right kidney, which permitted the conclusion that the patient had two kidneys. This taken together with the findings of the urine indicated there was trouble on the left side and apparently a fork-shape insertion of the left ureter into the right one by crossing the spine. The patient was a woman, 68 years of age, who had an enormous pyonephrosis, there being practically no kidney tissue left. Considerable pus was encountered in opening the kidney, and a stone was found lodged in the upper end of the ureter.

In the case reported by Dr. Steele there were two ureteral orifices in the bladder in the normal position where they are usually found. There was urine coming from both ureters, yet there was only one kidney. It remained to be proven whether these two ureteral openings led to one or two kidneys. The only possibility of establishing this fact was to take an X-ray picture. On a glass plate these shadows showed much more distinctly than they do in the print. In measuring the distance from the ureteral opening to the renal pelvis, he found twenty centimetres on the left side, and about eighteen centimetres on the right side, and in the picture on the glass plate the ureters are seen converging toward the median line.

Dr. Kreissl considered the possibility of making a mistake in judgment when using intravesical segregation in these cases, and spoke of the superiority of catheterization in combination with the X-ray. In a case like that of Dr. Cuthbertson's, where there was only one ureter, if one obtained a specimen of the urine by intravesical segregation, even preceded by a cystoscope survey of the bladder, one was unable to say whether there were one or two kidneys. In the other case there would be two working ureteral openings suggesting the presence of two kidneys, eventually leading into a disastrous nephrectomy. He said that Johnson, of New York, and Loewenhardt, who had devised this combined method, employed a lead stylet enclosed in an ordinary ureter-catheter. The bougie which he had seen used for this purpose quite frequently led to false diagnosis. At the narrowings of the ureter it was liable to be caught. When one introduced such a catheter into the ureter, and it was caught some-

where in a fold or at any of the anatomical narrowings, it would kink, and one would not be able to pass it farther; then if an X-ray picture were taken, one would see that the sound was coiled up, and this would lead one to make a diagnosis of stricture or even of a stone when there was none. The value of this method to determine enlargement of the pelvis of the kidney was problematical. If one should happen to enter the renal pelvis with a lead bougie, such as he had mentioned, it would likely coil up in such a manner that it would indicate a much distended renal pelvis. But it was not necessary to use it, because if there was a distended renal pelvis and the ureteral catheter entered the renal pelvis, urine would first escape as if it came through the ordinary catheter from a full bladder, and from the quantity of this urine one could determine the size of the distended renal pelvis. For sounding both ureters simultaneously it was better to use a bougie flexible and the end sufficiently bevelled so as not to injure the ureter, which the lead bougie was likely to do. For simultaneous catheterization, which was necessary in Dr. Steele's case, he found this cystoscope insufficient.

To obtain urine from both kidneys separately, smaller-sized catheters would be sufficient; but when larger-sized bougies or catheters were used, which are armed with a lead stylet inside, great difficulty would be encountered in passing both and in obtaining a shadowgraph of both sounds in the ureters at the same time, because of too much friction between the two moist catheters.

BOOK REVIEWS.

A TREATISE ON FRACTURES AND DISLOCATIONS. By LEWIS A. STIMSON, B.A., M.D., LL.D., Professor of Surgery in Cornell University Medical College, New York; Surgeon to the New York and Hudson Street Hospital, etc. New (4th) edition, thoroughly revised. Octavo, 844 pages. Lea Brothers & Co., Publishers, Philadelphia and New York, 1905.

In the fourth edition of Dr. Stimson's work, which follows the preceding edition after five years, the chief changes have been made in the following directions: In the study of the forms of fracture in the vicinity of joints by means of the Röntgen rays; in the more frequent resort to open operation in fractures; in the more extensive application of the Röntgen rays to diagnosis, thereby enabling more systematic classification and description, especially in the fractures and dislocations of the carpal bones; in the largely rewritten section on fractures of the lower end of the humerus in the young; in the reduction of old dislocations by open measures; and in many new illustrations added or substituted for the old.

The work of Dr. Stimson has long been highly esteemed. There is a terseness of expression and a practical way of putting the storehouse of accumulated information which it contains that are very readable and very instructive. The arrangement of the matter has been carried out upon an anatomical basis—and this systematic method of presenting the facts has made the imparted knowledge easier of understanding and retention. The bringing to bear of the Röntgen rays upon questions of diagnosis, and upon the corroboration of the opposition of broken bone-ends

and dislocated joint-ends accomplished by manual methods, has been well carried out. The matter of treatment by the various forms of splinting and postural methods is excellent and is generally well illustrated. The pathology and mechanism of fractures and dislocations are explained and pictured plainly.

The one direction in which the present writer would say there is need of dealing with in greater detail, is upon the application of the open method of treatment to those cases of fracture and dislocation where the ordinary methods prove inefficient. As already mentioned, greater attention than heretofore is given to this important subject,—and more to Dislocations than to Fractures,—but not as much attention, in detail, it would seem, as the subject deserves. This is the newest line of the application of surgical science to this category of traumatisms; and it would appear that enough trustworthy and creditable work has been done along these lines to make possible the working-out of more specific and definite technical details applicable to the more common fractures and dislocations, elaborating a distinct operative procedure to expose the ends of the broken or dislocated bones, in connection with the safe avoidance of important structures on the way to the site of trauma, together with the manner of dealing with the special conditions found. The time will undoubtedly come when definite operations for classically-recognized fractures and dislocations will be described and illustrated. Many men, especially those who operate less frequently, would operate more frequently if the technic of operation were more clearly laid down in individual and specific fractures and dislocations rather than generalized, and that often briefly and without detail, at the end of chapters or subjects.

A new and useful method of utilizing the corroborating power of the Röntgen rays in the putting into apposition of broken or dislocated bone-ends, not noticed by the writer in the review of the work, is the following: The patient lies upon a

wooden table of medium height, the Crookes-tube is placed beneath the table, and the surgeon, wearing "fluoroscopic spectacles" (a special form of fluoroscope strapped to the head), with hands thus freed, bends over the involved lesion, making and retaining the adjustment of the bones during the application of a retentive appliance, every step of which application he is thus able to watch, as to its bearing upon the disrupted bone-ends.

WARREN S. BICKHAM.

FINDLEY'S GYNECOLOGICAL DIAGNOSIS. A Treatise on the Diagnosis of Diseases of Women. For Students and Practitioners. By PALMER FINDLEY, B.S., M.D., Assistant Professor of Obstetrics and Gynecology, Rush Medical College. Octavo, 588 pages. Lea Brothers & Co., Philadelphia and New York, 1905.

All who are interested in gynecology realize the need of suitable works on this important subject. There should be, first, comprehensive treatises on the pathology of the subject; secondly, on the diagnosis of gynecological conditions; and, finally, on the treatment of these conditions, both operative and otherwise. While all three phases of this subject can be, and usually are, treated in one volume, it would seem best to have one or more authoritative treatises on each of its important phases. The need of such treatises in gynecological pathology are most urgent, for these should be the foundation of both the diagnosis of gynecological conditions and also their treatment. The lack of this foundation is most apparent to anyone reviewing the many gynecological text-books. It has caused not only an absence of uniformity among the different writers but has also, at times, led to the artificial and erroneous classification of diseased conditions and their treatment; as, for example, let any one compare the subject of endometritis as discussed in any six of our modern text-books and note the lack of uniformity in the classification and pathology of this condition.

The writer of the present volume has covered the first two phases of the subject by considering the question of the diagnosis of gynecological conditions in connection with the pathological changes giving rise to these.

The first part of the present edition, consisting of 123 pages, is devoted to the consideration of the general diagnosis of gynecological conditions,—*i. e.*, the history of the case, the symptoms peculiar to gynecological cases, and the methods used in the examination of the patients and in the determination of the cause of the trouble. In Part II, consisting of 360 pages, the special diagnosis of gynecological diseases is considered; and Part III, of 88 pages, is devoted to the diagnosis of the diseases of the urinary system.

The work is thorough, systematic and well indexed, and the illustrations show what the author wishes to emphasize. The publishers state that the first edition has been exhausted and that the present represents a thorough revision of the previous one, with the addition of nearly 100 pages of text, 12 engravings and 14 colored plates. The work can be recommended as the best we have in a field where such a work is greatly needed and in which there are too few contributions.

JOHN A. SAMPSON.

CORRESPONDENCE.

THE TRANSVERSE INCISION IN APPENDICITIS.

EDITOR ANNALS OF SURGERY :

Since the publication in the issue of the ANNALS of January, 1906, of my article on "A transverse incision for the removal of the appendix," I have received from Dr. H. Chaput, of Paris, France, a note stating that he had published a memoir in June, advocating the same procedure. A search of the Index Medicus failed to reveal the article and it was only by accident that later I found it in *La Presse Médicale*, June 3, 1905. After describing the incision external to the rectus he says: "*Chez les hommes, le muscle droit est peu éloigné de l'épine iliaque; J'incise alors horizontalement la partie externe de ce muscle sur une longueur de 1 a 2 centimètres environ.*" (in men the rectus muscle being but a short distance from the iliac spine; I therefore incise the external part of that muscle for a distance of about one or two centimetres.) That the two procedures resemble each other is evident; that they are identical is, I think, doubtful.

It is needless to say I was in ignorance of Dr. Chaput's article or I would have mentioned it: how it came to be omitted from the Index Medicus I do not know.

GWILYM G. DAVIS.

PHILADELPHIA, May 7, 1906.

All contributions for publication, books for review, and exchanges should be sent to the Editorial Office, 386 Grand Ave., Brooklyn, New York.

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